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A SPIRITED DISCUSSION.

VARIOUS PHASES OF THE NAVAL BILL BROUGHT OUT SOME SHARP AND BRILLIANT SAYINGS—ARMOR PLATE QUESTION AND COAST SURVEY WORK.

The discussion of the naval bill before its passage by the house of representatives brought forth many humorous sallies and some satirical ones, too. The discussion was quite general and was participated in by several members. The minority, who wish to establish an armor plate factory, offered to compromise by authorizing the secretary to ask for bids for armor plate at $445 per ton and in case it could not be obtained at that price to pay $545 and then proceed to purchase a site for an armor plate factory. Speaking of the delay with ships under construction from lack of settlement of the question of armor by congress, Mr. Cummings said:

"I want these ships completed, and I am not in favor of holding them up for the establishment of a government factory as long as we can get the armor at a less price than European and Asiatic nations pay." He stated that it had been demonstrated to the satisfaction of the committee that England was paying $587 per ton, Russia $565 (to the Cramps), France $605, Germany nearly $600 and Japan, in one instance at least, $700.

In answer to a question as to whether we are getting better armor than European nations, Mr. Cummings said: "Yes, armor that has no blowholes in it; no harveyized stuff, but the genuine article; something that you would not be ashamed to wear yourself if you could."

Mr. Cannon called attention to the fact that the navy department estimated the present cost of an armor factory at $4,872,000. On the motion to appropriate $2,000,000 for a factory the chairman ruled that it was new legislation and out of order. The house sustained this decision on appeal. Mr. Underwood, in support of the amendment before it was ruled out, said: "I find that materials consumed in the manufacture of a ton of armor cost only $56.75; that the entire labor cost for a ton of armor plate is only $43.65; that the cost of keeping the plant ready for use is $9.80 a ton; that shop expenses are $2.38 a ton; office expenses and contingencies $3.34 a ton; experimental work $1.67 a ton; administration and engineering $21.40 a ton."

The clause increasing the price paid for armor to $545 a ton was also ruled out as new legislation. Mr. Vandiver said on this point that the law now limited the price to $300. "If that be the law, this provision here, which increases the price to $545 per ton, evidently changes existing law."

The question of coast survey work led to the longest and bitterest debate. In discussing this subject Mr. Woods of Massachusetts said:

"We have now a coast survey which has been in existence almost a century. The proposition contained in this bill is to establish another and a parallel coast survey which shall not be under civilian but under military control. It is proposed to change a great department of the government service from civilian to military control to reverse the deliberate policy of congress, which has prevailed for nearly sixty years. The coast survey was established as a civilian department in the year 1807, and remained such until 1818, when it was transferred by law to the navy department, and there remained, with very unsatisfactory results, until the year 1832. Then, upon the recommendation of the secretary of the navy himself, who pointed out that, while the work of the naval establishment had been useful, it had been very expensive in proportion to its usefulness, it was again transferred to the control of the treasury department. In 1834, two years afterward, it was turned over to the control of the navy department, and remained there but two years, when it was transferred back again to the control of the treasury.

"Believing it was necessary to settle for all time this long-vexed question congress appointed a commission, consisting of three naval officers, three army officers and three civilians, and in 1843 they agreed unanimously upon a report that the subject of the survey of our coasts was a proper subject for civilian activity and should no longer be under the control of the navy department. Accordingly, from that day to this the work of the survey of our coasts has been under the control of the treasury department and in the hands of civilians, with the aid of such officers of the navy as from time to time have been detailed.

"In 1884 a commission was appointed—a congressional commission was appointed—and after considering the subject for two years they reported to congress that it was very unwise and inexpedient to transfer this department from the control, the civilian control, of the treasury to the military control of the navy department. Everybody agrees that we ought not to have two coast surveys. If we establish the military we ought to abolish the civilian. We do not want one coast survey for the coast of continental United States and another for our insular possessions. Is it not a strange thing that when the secretary of the navy tells us that the navy today, for its own duties, is 1,447 officers short, we should expand the activities of the navy over a proper civilian sphere? The navy has neither the ships, nor the men, nor the officers with which to efficiently and economically perform this work."

Mr. Moody took up a comparison of expense of coast survey made by the Eagle and Yankton for the navy at a cost for the year of $46,000 for each vessel, and by the Blake, civilian vessel, at $25,000. He insisted that the latter did the work better than the navy did it.

Mr. Foss said in answer to the points made by Mr. Moody: "We are not seeking to abolish the coast and geodetic survey. All we are seeking to do is to hold the coast and geodetic survey to the original jurisdiction which was given it under the revised statutes at large. Ever since the American navy was established it has always made the ocean surveys. Now, shall we build up another naval corps to do the same work when our own officers and our own men on the ground can conduct these operations without any large additional expense to the government whatever? Every foreign navy in the world makes its own coast surveys, with the exception of the little navy of Portugal and our own. My friend says they have a special corps abroad. Why? Because they do not educate a naval officer as we educate him. The foreign sailor knows one thing. When unforeseen circumstances come upon him, when great emergencies arise, he stands there and knows not what to do. But when our American officer is called upon to meet emergencies, he, by reason of the completeness of his education, becomes the master of obstacles and emergencies and makes them the stepping stones to fame, to reputation and to glory."

Mr. Cummings, speaking of the coast and geodetic survey, said: "It is a navy within a navy. The present superintendent has adopted a flag, used while he is afloat, which resembles very much the flag used by Admiral Dewey. The officers are arrayed in a uniform more gorgeous than any uniform worn at the battle of Manila. I had a letter from an old boatswain in the navy, now employed in the coast and geodetic survey. I have mislaid it. He is employed in the coast and geodetic survey, but he has served twenty years in the United States navy. He wrote to me saying: 'Cummings, it is pie. Nobody here knows anything about naval matters but me, and I have been appointed commander of the vessel, although I was nothing but a boatswain in the navy.'"

Other speakers took up the subject very earnestly and an amendment by Mr. Cannon was finally adopted making the appropriation for special ocean surveys and publication thereof $10,000.

In his general remarks upon the subject of the navy Mr. Cummings grew quite brilliant, saying:

"From the days of Salamis down to the present a strong navy has been the safety of a maritime nation. It was the American navy that gave us peace in the treaty of Ghent in the war of 1812. It was the American navy that gave us the victory in the war with Mexico. It was the American navy that sounded the knell of doom for the confederacy when gallant old Farragut broke the iron barrier, passed the forts of Jackson and St. Philip and captured the city of New Orleans. It was the navy, I may add, that won the Spanish war. I believe that if Schley and Sampson had been left to their own inspiration, or had received the orders that Dewey received, they would have gone into Santiago harbor without sending an army down there to storm San Juan and El Caney. It was the navy, under Dewey, that destroyed the Spanish fleet and won the empire in the east; and it was the navy that finally brought proud Spain to her knees with her hands held upward, acknowledging her subjugation. So, I say, the navy is a vital necessity to the United States as well as to all other maritime nations. This vital necessity is recognized by the people of the country—north and south, east and west."

In regard to sheathing of ships Mr. Cummings said: "The navy department is peculiarly constructed. One year its board decides it is best to have sheathed ships. That was done a year or two ago. Afterward England built some unsheathed battleships; ships intended for use on her own coast, and not to be sent to foreign harbors. Of course, our navy was compelled to follow the example set by England. Whether the secretary of state was consulted or not I cannot say. The new board decided that sheathed ships were not needed. Boards are at times necessary contrivances, but not necessarily useful. Take the case of the Holland. Here was a board that was to make a report on the submarine boat Holland. They came back and reported in her favor but at the same time expressed the opinion that submarine boats were useless—England was not building any of them. The navy department, however, has bought the boat, and I have had the honor of introducing a bill providing for the purchase of twenty more of them. I am strongly of the opinion that the provision ought to have been inserted in this appropriation bill, and I think those who have seen the Holland's surprising performances will agree with me. I will answer for Admiral Dewey."

"In Toledo we are a little proud of the fact," says a vessel owner from that port, "that we were the first to build the type of cargo steamer that is suited to both lake and coast service. The vessels built by the Craig company for Miller, Bull & Knowlton of New York, to engage in trade with Cuba and Porto Rico were really the forerunners of the great fleet of similar vessels for which negotiations are now under way. You will notice that the American Ship Building Co. is said to be planning for the construction of probably forty such vessels. I have no doubt that a big undertaking of this kind is being seriously considered as great opportunities are offered for such vessels. The steamer Tampico, launched by the Craigs a few days ago for Mr. Hawgood and others of Cleveland, is in every way suited to salt water service but she will remain on the lakes during the present season, on account of the profitable freights now prevailing."

"I am satisfied," said the manager of the largest fleet of steel tow barges on the great lakes, "that we would never have built barges of more than about 3,000 to 4,000 tons capacity if it were not for the introduction of the Shaw & Spiegle steam towing machine by the American Ship Windlass Co. That machine has done more for the development of cheap transportation by means of large tows than all the progress of the past ten years in other lines, except possibly the deepening of channels. It would be absolutely impossible to handle our modern tow barges of 6,000 to 8,000 tons capacity without these machines."

The largest steam yacht in the world, the Margarita, to be owned by Col. A. J. Drexel of Philadelphia, was launched on the Clyde this week. G. L. Watson, the famous British naval architect, was commissioned to build a yacht as speedy, as comfortable and as safe as it was possible for money to make it. The Margarita is the result. The dimensions of the yacht are: Length over all, 323 feet; load water line length, 272 feet; beam, 36 feet 6 inches; draught 16 feet 8 inches. She will be fitted with Scotch boilers and triple expansion engines and is designed for a speed of 17 knots.

SLOCUM TO SAIL ALONE AGAIN.

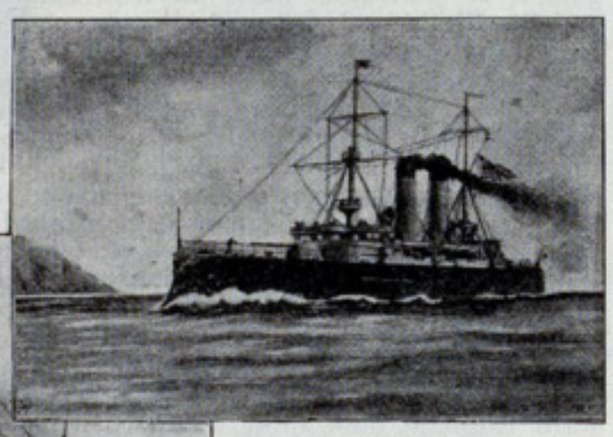
Capt. Joshua Slocum, who made himself famous in sailing around the world alone in his little sloop yacht, the Spray, is preparing for another trip alone. This time he proposes to go to Iceland and thence to England. The little craft is now at Bridgeport, Conn. The Bridgeport Standard gives the particulars as follows:

"Shipping circles and those who are interested in the matter at all are at present talking of the attempt which is to be made from this city in a short time by Capt. Joshua Slocum, to sail single-handed to Iceland and thence to England in his staunch little sloop, the Spray. While the attempt will not be made for at least a month yet, as the time draws near for the intrepid navigator to again sail forth on one of his lonely voyages, the Spray is becoming more and more a center of interest. The little boat now lies out of the water at Robbins' ship yard. She has not as yet been overhauled for the spring. There is, however, a much better opportunity to obtain an idea of her size and lines now that she is out of the water, and the daring of any attempt to sail a stormy ocean in such a small craft will be at once realized after a glance at the craft. The Spray is the boat in which Capt. Slocum has already sailed a matter of many thousands of miles, completely circumnavigating the globe all alone in it.

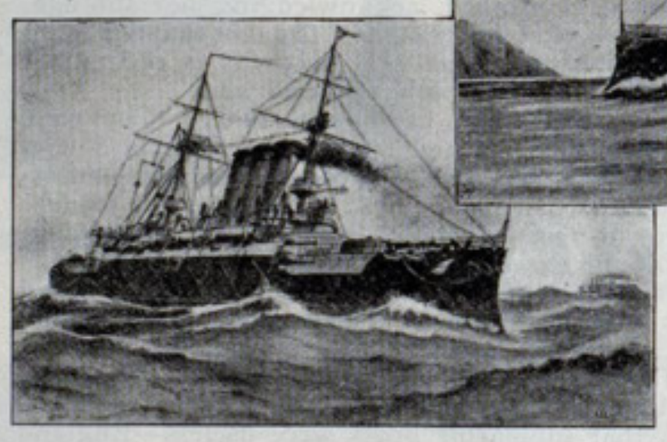
"The fact that the captain has already accomplished one voyage in it does not in any way lessen the danger which threatens any one making such an attempt for the second time. He has learned nothing new in the handling of a boat during his trip around the world. He must have known all there was to know before he started, or he would never have reached even the first point at which he aimed after having left Boston harbor. As far as the fitting out is concerned there is but little to do beside the storing of provisions and other necessities for the voyage. The only portion of the staunch little craft which was at all touched during her long voyage was her forefoot, which the sea worms have eaten into to some extent. No alterations or repairs will be necessary, save some slight repairs to her shoe."

TWO NEW WARSHIPS.

Two more warships recently launched from the Elswick yards of the great English ship builders, Sir W. G. Armstrong, Whitworth & Co., Ltd., are illustrated herewith. The first was the cruiser Iwate for the Imperial Japanese navy She was christened by Mme. Arakawa and is provided with accommodations for an admiral, fifty-two officers and 430 petty officers and men. Her displacement is 9,750 tons; indicated horse power, 14,500; speed, 20.75 knots.



Norwegian Armor-clad Norge.



Japanese Armored Cruiser Iwate.

The second vessel was the armor-clad Norge for the Royal Norwegian navy which was christened by Mrs. Saxton Noble. The Norge has a length of 290 feet; beam, 50 feet; depth, 26 feet 6 inches; and draught, 16 feet 6 inches. The displacement of this vessel is 3,850 tons; indicated horse power, 4,500; speed, 16.5 knots.

ARMY OR NAVY CHARTS?

It would seem that in trying to secure in the naval appropriation bill an item that relates in part to the work of the branch hydrographic offices on the great lakes the navy is being opposed by the coast and geodetic survey and by the army engineer corps, which latter organization has for years past been engaged in making and correcting lake charts. Following is a communication on the subject that was issued a few days ago from the branch hydrographic office at Cleveland to commercial bodies in lake cities:

"There is in circulation amongst members of congress a belief that the navy is seeking to obtain control of the surveying of the great lakes. This is not the fact. The hydrographic office has not asked for this control and does not wish it. What it does request in the appropriations now pending is to be provided with funds for the purpose of quickly locating reported dangers to navigation from Buffalo to Duluth, by being authorized to employ a tug and the necessary help, under the direction of the officers in charge of the branch offices, to immediately proceed to the scene of the reported danger, locate it and report to the light-house authorities the exact position, so that it may be buoyed until the obstruction can be removed by the authorized branch of the government, which is the army. The navy has not, nor has it had any intention of in any way invading the prerogatives of the army.

"The law establishing the hydrographic office, and the appropriations for many years, compelled the office to issue charts for the guidance of mariners; and it will be seen by any comparison made between charts of the hydrographic office and those issued by the army, that the former are purely for the mariner, that they contain everything necessary for his guidance, and that for such purposes they are superior to the army charts. If the lake associations of all kinds shou'd act and state that our charts are not required, undoubtedly their publication would cease. The question is this, is it, or is it not desirable that the charts issued by the hydrographic office be not published? Of course, it must not be a snap judgment, but one made after reflection and on the merits of the case. Therefore will you be pleased to address me a letter containing the opinion of your association in regard to the desirability or the reverse of a continued publication of the hydrographic office charts for the great lakes?"

TESTIMONIALS FOR KEARSARGE AND ALABAMA.

The committee appointed by Gov. Rollins of New Hampshire to select a design for the testimonial to be presented to the battleship Kearsarge has completed its work. In its report the committee says:

"The great naval duel of the civil war was between the o'd Kearsarge and the old Alabama, and the Kearsarge won her glory by destroying the Alabama. So when the two great battleships, Kearsarge and Alabama, are about to enter the service of a united nation can New Hampshire do a more worthy act than to add to the glory which surrounds the name of Kearsarge by making it a pledge between New Hampshire and Alabama that they and these two noble ships are united for the defence and welfare of a common country."

The work on the Kearsarge will be a large bronze bas relief to be placed on the forward turret between the two 13-inch guns. The sculptor is Bela W. Pratt of Boston. The gift for the Alabama will probably be a large design in bronze, appropriately inscribed, to be placed in one of the turrets. Dr. Tucker of Dartmouth college has been asked by his colleagues on the commission to prepare the inscription. The presentation to the two ships will take place in Portsmouth harbor probably in June and in the presence of the North Atlantic squadron. There will be a land parade and it is expected that President McKinley, the governor of Alabama and other dignitaries will be there.

NAVAL PROGRESS IN RECENT YEARS.

A very interesting and suggestive paper on the subject "Naval Progress in Recent Years" was recently read by Mr. C. A. Yates, chief naval constructor at Portsmouth dock yard, before the Portsmouth Literary and Scientific Society. The author, after tracing the remarkable developments of the last twenty years, ventured the opinion that in twenty years hence our present battleships would probably be obsolete and in their place a magnificent fleet of ships of quite another type would form our first line of defense. Instead of trying to put every variety of weapon of offense and defense in one ship we should probably have fleets composed of groups of vessels of different types. Each group would have one particular mode of offense and the admiral would arrange for each to deal its blow at the proper time. One group, for example, would be restricted to firing guns; a second would have nothing to do but to discharge torpedoes, and each vessel would be so protected as to be able to run the gauntlet of the enemy's guns. A third group would be designed to ram a partially disabled enemy. The plan of naval organization would thus be analogous to that of the army, composed of infantry, artillery and cavalry. This would be necessitated by the impossibility of the captain to control such a complex weapon as a modern battleship and bring all her offensive and defensive powers into action at the precise moment. If, on the other hand, a ship had but one thing to do, every man would know exactly what he had to do in battle.

MODELS FOR THE EXPOSITION.

In view of the Paris exposition the extensive workshops of Messrs. Kelso & Co., model makers and electricians, Glasgow, have for a considerable time past been taxed to the uttermost in producing ship models and model fittings. They have just dispatched three full models of more than usual interest. One of these represents a first-class armored cruiser of the British Terrible type. Another represents the Pacific Steam Navigation Co.'s Steamship Ortona, 520 feet by 55 feet by 37 feet, and the third is a model of a Dutch cruiser now under construction on the continent. All these are full models to a scale of ¼ inch per foot and in their handsome glass cases form admirable specimens of the model-makers' art. Every feature down to the minutest detail is reproduced and counterfeited with marvelous fidelity to the actual objects on board the full-sized originals.

TRIGG COMPANY IMPROVEMENTS.

The ship yard of the W. R. Trigg Co., Richmond, Va., is to be immediately enlarged. One of the Richmond papers, speaking of the improvements, says:

"It is proposed to greatly widen the channel of the dock between Seventeenth and Nineteenth streets and to locate all the shops on the opposite bank between the dock and the river. The channel of the dock between Twenty-fourth and Twenty-sixth streets will also be widened into a laying-up basin. It is proposed to put in a shiplock at the lower end of the laying-up basin to admit vessels too large for entrance from the river into the smaller lock at the lower end of the dock. The enlargement was made necessary by the great amount of work in prospect. The yards already have contracts for government vessels aggregating $2,300,000. The indications are that this amount will be doubled before the end of the present year. The company has contracts with the Holland Torpedo Boat Co. to build a large number of its boats when the pending purchase of this submarine craft is ordered by congress. In addition to all this the Trigg people have recently received so many inquiries for merchant vessels that to build them all will require greatly increased capacity of the yards."

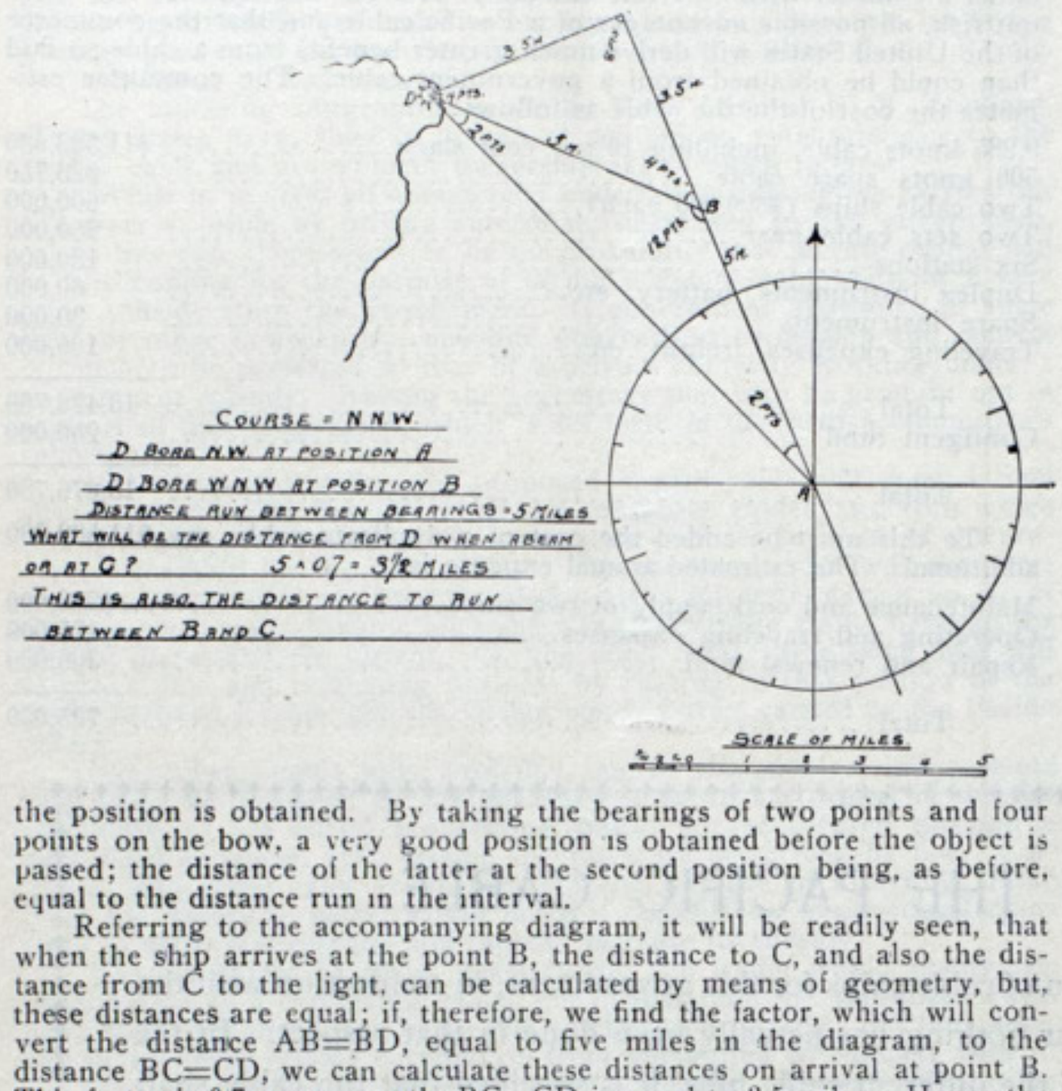
The company has secured an amendment to its charter to increase its capital stock from $400,000 to $2,000,000. Of this amount $800,000 will be 7 per cent. preferred stock. The company will make enlargements and improvements to its plant to cost $800,000.

The new company which has absorbed the steamship lines of Frederick Leyland & Co. and the Atlantic Transport Co. will hereafter be known as the Frederick Leyland Line, Ltd. The total gross tonnage owned and controlled by the new company will, it is said, exceed 300 000 tons and the assets acquired by the company will, apart from good will, exceed £4,000,000. The share capital is to be £4,700,000 in 270,000 5 per cent. cumulative preference shares and 200,000 ordinary. The latter will be held by the present proprietors, while to the public will be issued 207,500 5 per cent. cumulative £10 shares at par. Out of the proceeds of this issue £1,650,000 represents additional cash working capital.

EXTENSION OF "FOUR-POINT BEARING."

PREPARED BY FRANK HENRICH, NAUTICAL EXPERT, DULUTH, FOR 1900 DIRECTORY OF SHIP MASTERS' ASSOCIATION.

In passing near a point of land, island, or light-house, the method of determining the distance by doubling the angle on the bow is invaluable. The ordinary form of it, the so-called "four-point bearing," when the bearing is taken four points on the bow, and on the beam, the distance from the object at the latter position being the distance run between the times of taking the two bearings. gives an excellent result, but does not insure safety, as the point, and probably the rocks off it, are abeam before



the position is obtained. By taking the bearings of two points and four points on the bow, a very good position is obtained before the object is passed; the distance of the latter at the second position being, as before, equal to the distance run in the interval.

Referring to the accompanying diagram, it will be readily seen, that when the ship arrives at the point B, the distance to C, and also the distance from C to the light, can be calculated by means of geometry, but, these distances are equal; if, therefore, we find the factor, which will convert the distance AB=BD, equal to five miles in the diagram, to the distance BC=CD, we can calculate these distances on arrival at point B. This factor is 0.7, consequently BC=CD is equal to 3.5 miles. Hence the rule:

Take a bearing of the object two points on either bow and run until the same bears four points on the bow. The distance run between these bearings is equal to the distance from the object at the second bearing. Multiply this distance by 0.7 and you have the distance from the second bearing until you are abeam. Also the distance from the object when abeam.

THE COMPASS ERROR.

PREPARED BY BRANCH HYDROGRAPHIC OFFICE, CHICAGO, FOR DIRECTORY OF SHIP MASTERS' ASSOCIATION.

Error—The compass error is composed of variation and deviation.

Variation—The magnetic pole is at some distance from the true pole of the earth, and since the north end of the needle is drawn towards the magnetic pole, the line of its direction varies from the direction of the true meridian, and this angle between the true meridian and the direction in which the needle points when unaffected by any other influence than the earth's magnetism is the variation for the locality where observed, and is named easterly or westerly according as the north end of the needle is drawn to the eastward or westward of the true north.

Deviation—That portion of the error called deviation is caused by the attraction of the iron and steel of a ship, or her cargo, and varies on different headings of the ship. It is named easterly or westerly according as the north end of the needle is drawn to the eastward or westward of the magnetic north. The deviation will vary from easterly to westerly as the ship is swung around on the various points of the compass.

Cargoes of iron and iron ore have a strong effect upon a ship's compass, which may rise to several points, and is sure to affect it several degrees in uncompensated compasses. Thus the deviation of the compass should be known on various headings when loaded, and also when light. Even compensated compasses show residual deviations which should be known.

TO FIND DEVIATION FROM COMPASS BEARINGS OF SUN.

Observe a bearing of the sun by compass, using an azimuth circle, or more cheaply but roughly a shadow pin fitted over center of compass card. At the same instant note the direction of ship's head (by same compass), the watch time to the nearest minute, and correct this if central or eastern time for the longitude in (see table below), which will give you local mean time; to this apply equation of time to get local apparent time.

With this apparent time, the approximate latitude of the place, and either the sun's declination or day of the month (declination to be taken from table issued in "Notice to Mariners," which is compiled especially for the great lakes, or from the "Nautical Almanac,") enter the proper table of the azimuth tables (as shown by the latitude you are in, and the declination of the sun, or day of the month) and pick out the corresponding true bearing of the sun.

Apply to this the variation (taken from chart) for locality in, and the result will be the sun's magnetic bearing. The difference between the observed compass and magnetic bearings of the sun will be the deviation of the compass on that point on which the ship was heading at the time of observation, and will be marked either E. or W. according as the magnetic bearing is to the right or left of the compass bearing.

HOW TO OBTAIN COURSE TO BE STEERED BY COMPASS.

Take a set of parallel rulers and lay one edge from point of departure to destination, or point of changing to another course on hydrographic chart. Step the rulers one at a time, keeping one of the rulers always firmly set in original direction until the edge used passes through the center of the nearest compass rose on the chart. Then read off the magnetic course from inner compass rose, which allows for variation. Apply the deviation of your compass for the course, and the resulting reading will be the compass course to be steered.

TO APPLY THE COMPASS GRIP.

If the variation and deviation are of like name add them together to obtain the compass error; if of unlike, subtract less from greater, and the error will have the same name as the greater. If the error is easterly, take the reading as many points or degrees to the right of the compass reading as there are points or degrees in the error; that is, change the reading of the compass with the hands of a clock by the amount of the error.

If the error is westerly, take the reading as many points or degrees to the left of the compass reading as there are points or degrees in the error; that is, change the reading in a contrary direction to the hands of a clock by the amount of the error.

TO GET APPARENT TIME TO USE IN AZIMUTH TABLES.

The local apparent time, with which the azimuth tables are entered is obtained from local mean time by applying the value of the equation of time for the date of observation (given in "Nautical Almanac" or "Notice to Mariners").

CORRECTIONS TO BE SUBTRACTED FROM SEVENTY-FIFTH MERIDIAN TIME TO REDUCE IT TO LOCAL MEAN TIME IN THE FOLLOWING LONGITUDES:

Longitude W.	Correction.	Longitude W.	Correction.
° ′	*Minutes.*	° ′	*Minutes.*
76 00	4	80 00	20
76 30	6	80 30	22
77 00	8	81 00	24
77 30	10	81 30	26
78 00	12	82 00	28
78 30	14	82 30	30
79 00	16	83 00	32
79 30	18	83 30	34

CORRECTIONS TO BE ADDED TO NINETIETH MERIDIAN TIME:

Longitude W.	Correction.	Longitude W.	Correction.
° ′	*Minutes.*	° ′	*Minutes.*
78 00	48	84 00	24
78 30	46	84 30	22
79 00	44	85 00	20
79 30	42	85 30	18
80 00	40	86 00	16
80 30	38	86 30	14
81 00	36	87 00	12
81 30	34	87 30	10
82 00	32	88 00	8
82 30	30	88 30	6
83 00	28	89 00	4
83 30	26	89 30	2

CORRECTIONS TO BE SUBTRACTED FROM NINETIETH MERIDIAN TIME TO REDUCE TO LOCAL MEAN TIME IN FOLLOWING LONGITUDES:

Longitude W.	Correction.	Longitude W.	Correction.
° ′	*Minutes.*	° ′	*Minutes.*
90 30	2	92 00	8
91 00	4	92 30	10
91 30	6		

WELLMAN DUPLEX ROLLER BUSHING.

There has recently been completed at the navy yard, Brooklyn, an exhaustive scientific test to ascertain the relative merits of several kinds of anti-friction bushings, in competition with the Wellman duplex roller bushing, adopted some years ago by authority of congress for general use in the navy. Complaints had been made as to the exclusive use of this standard bushing, and claims were set forth by a certain manufacturer that his blocks were superior. The tests showed the very considerable all-round superiority of the duplex roller bushing in lack of friction, durability and ease, and cheapness of repair. The blocks supplied by the complaining company were so completely used up by the time the test was half finished that they were declared out of the test.

FASTEST CRUISER IN THE WORLD.

The French navy is now said to have the fastest cruiser in the world, gaining this honor from the recent speed trial of the first-class cruiser Chateaurenault at Toulon when she made 25 knots. The Chateaurenault was laid down at La Seyne in 1897. She is 442 feet 10 inches long, 55 feet 9 inches beam, and has a depth of 24 feet 6 inches. Her displacement is 8,018 metric tons and she has an indicated horse power of 23,000. Her armament consists of two 6.4-inch quick firing guns and ten 1.8-inch guns. Her complement of officers and men is 625.

CONSTRUCTION OF A TRANS-PACIFIC CABLE.

The construction of a trans-Pacific cable is still causing much discussion in Washington and the views held upon the subject are various. They may, however, be divided into two classes—those who are in favor of construction by a private corporation with government support and those who are in favor of the government undertaking the work through the navy department. The head and front of the former is Representative Sherman of New York who some time ago introduced a bill in the house authorizing the postmaster-general to pay to an American company who will construct the cable the sum of $300,000 annually for twenty years, in consideration of which the company is to transmit government messages free during the life of the contract and at one-half the usual commercial rate thereafter.

But since the introduction of this bill in the house and since a report was made upon it by the committee on interstate and foreign commerce, the senate has passed a cable bill introduced by Mr. Hale. The Hale measure appropriates $3,000,000 for the construction of a cable under supervision of the navy from San Francisco to Honolulu in accordance with surveys already made by the same. The tenor of dispatches from Washington is to the effect that if an act providing for a cable is passed by the present congress it will be the senate measure rather than Mr. Sherman's bill. The discussion in committee relative to this latter measure is, however, very interesting.

The house committee on interstate and foreign commerce was divided in its report on the Sherman bill. In discussing the matter, the majority of the committee who favor the bill, say that all doubt as to the practicability of establishing such a line of trans-Pacific cable has been removed by the surveys recently made by the United States government and a practicable cable route has been found, starting from San Francisco and going to Honolulu, Guam and Manila, a distance of 6,872 knots, or 8,220 knots if an extension from Guam to Yokohama is included. No money whatsoever is to be paid by the United States to the contracting company until the line to the Philippines is completed. The maximum rates to be charged by the company are never to exceed 35 cents per word between San Francisco and Honolulu and $1 per word between San Francisco, Manila, Japan, Hongkong and Shanghai, which is less than one-half the existing rates. In case of war, rebellion or other emergency the United States government may take possession of the lines and stations at all points within its jurisdiction and use and operate the same. The bill provides that the cables to be laid shall be of American manufacture and laid and maintained by an American company and by ships flying the American flag.

ARGUMENT AGAINST A GOVERNMENT-OWNED CABLE.

The majority in its report first disposes of the arguments in favor of a government-owned cable which it epitomizes as follows: First, that it would be completely under the control of the United States government and second that a government cable would be more economical to the United States. The commitee answers the first by saying that in case of war the government could take possession of the cable and the second by saying that the necessity of duplicating the cable is lost sight of in the argument of economy. In order to be of practical utility cables have to be duplicated. The Anglo-American cable, laid in 1869, lived only twenty-four years. In that time there were twenty interruptions, of which the longest was ten months, and roughly speaking the cable was interrupted five and a half years out of the twenty-four. The three Atlantic cables of the Commercial Cable Co.'s system, the first of which was laid in 1884, have been interrupted seventy-eight times. Of the Anglo-American's seven cables two and usually three have been interrupted at the same time. The following disadvantages of a government-owned cable occurred to the committee: The first great cost of establishing a government trans-Pacific cable system, that is $15,000,000; second, the comparatively great annual cost of a government cable, estimated at $1,500,000; third, the inability of the United States to land and operate a government-owned cable either in Japan or China; fourth, that as a government cable would not obtain traffic to and from China and Japan, its income would be limited to traffic to and from the Philippines and Hawaiian islands, which at an outside estimate would not exceed $150,000 annually, while the annual expense would be $1,500,000; fifth, that assuming that a government cable could reach China and Japan and secure all the business that a private company might develop, still, if the experience of American cable companies in Central and South America is repeated in the Philippines, China and Japan, as now seems probable, 90 per cent of the whole telegraph traffic will be carried on by less than 400 customers, 300 of whom will be foreigners and the balance inhabitants of the United States, so that the proposition to establish a government cable system would mean a tax amounting to an outlay of $15,000,000 and a large annual expense for the benefit of only 100 Americans and 300 foreign firms and corporations.

FAVORABLE TO PRIVATE OWNERSHIP OF THE CABLE.

In the argument for the construction of the cable by a private corporation the committee contends that the $300,000 to be paid annually is by no means a subsidy, as the government receives advantages for every dollar paid. The committee is convinced that the government will secure, under a contract with a private company, at much less expense and without risk, all possible advantages of a Pacific cable and that the commerce of the United States will derive much greater benefits from a cable so laid than could be obtained from a government cable. The committee estimates the cost of the the cable as follows:

9,285 knots cable, including 10 per cent slack	$11,583,030
500 knots spare cable	623,750
Two cable ships ($300,000 each)	600,000
Two sets cable gear	250,000
Six stations	180,000
Duplex instruments, battery, etc	60,000
Spare instruments	30,000
Traveling expenses, freight, etc	100,000
Total	13,426,780
Contigent fund	250,000
Total	13,676,780

To this must be added the cost of a duplicate cable, say $11,500,000 additional. The estimated annual expense is:

Maintenance and coal supply of two ships	$250,000
Operating and traveling expenses	175,000
Repair and renewal fund	300,000
Total	725,000

To this must be added interest on the cost of the cable, say at 3 per cent., $410,000, or on a duplicate cable about $750,000. The sum of $1,226,000 represents the total cable business at the present time between Europe, America and the three countries named, namely, Japan, China and the Philippine islands. At the outset an American Pacific cable entering the field could not hope to do more than one-third of the above business which would realize annually the sum of $583,000. The enterprise, therefore, is not an attractive one financially.

The laying of the trans-Pacific cable, the committee argues, is unlike any other undertaking and should be treated in a liberal spirit. In round numbers about 10,000 miles of cable will be laid and the government is therefore only called upon to pay $30 per mile a year. This is a less amount per mile than is paid by any other government for a like service. In 1857 when the first Atlantic cable was laid the government agreed to pay $70,000 a year for twenty years for a cable less than 2,000 miles in length and the British government gave a like amount, making a rate of over $70 per mile. The German government recently agreed to guarantee to a German company for establishing a direct cable from Germany to the United States, via the Azores, $350,000 a year for forty years. This is a guarantee of 7 per cent on the investment, and in addition the government is expected to pay full rates on all messages. This, in brief, is the argument of those who favor the construction of a cable by private enterprise.

SPIRITED ARGUMENT AGAINST PRIVATE CONTROL.

The report of the minority is a spirited document. It begins by saying that the grant to a private company would speedily become a monopoly for which the government would have contributed one-half the cost. Continuing, the committee says:

"A new era has dawned upon our country. For over a century the genius and industry of our people have been applied to the development of our natural resources and internal trade and industries, until every part of the United States has been supplied with means of rapid communication and transportation; until every city, town and hamlet has been made to feel the benefit of industrial enterprise; our navigable lakes and rivers have been improved until our inland waters are dotted with a merchant marine equal to the present necessities of commerce; our agricultural lands and natural resources have been developed until they are

GEN. A. W. GREELY ON THE PACIFIC CABLE.

Editor Marine Review:—In regard to the construction of cable ships for this government, in connection with the laying of the proposed Pacific cable, I may say that thus far nothing has actually been done in that respect. In the recent action of the committees of congress having charge of the different cable bills, it is specified that the cable shall be of American manufacture and laid by ships flying the American flag. I have advocated from the beginning the establishment upon American soil of a deep-sea cable industry of the first class, together with cable ships, appliances, operating instruments, and all necessary accessories to place the completely equipped cable entirely free from foreign control, in time of peace or war.

A. W. GREELY,
Brigadier General, Chief Signal Officer, U. S. A.

capable of producing sufficient product to supply the markets of the world. The time has arrived in our marvelous development when, in order to continue the march of American progress, we must reach out and command the commerce of the sea. Great Britain has achieved her commercial supremacy by the purchase or construction and control of the great canals; by the acquisition of territory and the establishment of her colonies in every part of the world; by the construction and ownership of cables to every part of her vast possessions, thereby securing rapid communication at reasonable rates for her trade and commerce. We should profit by her example and connect the waters of the oceans by the Nicaragua canal, and join together the islands of the Pacific with a cable constructed, owned and operated by our government for the benefit of the people, without profit or hope of gain, save the expansion of our trade and the development of our merchant marine and commerce. Great Britain has officially had under recent consideration a proposal for laying a telegraphic cable between British North America, through the Pacific, to the colonies of Australasia."

The following suggestions made by Rear Admiral R. B. Bradford, United States navy, chief of bureau of equipment, with reference to the British cable and government ownership are of much interest:

"While in general all commercial undertakings should be carried out whenever possible by private enterprise, unassisted by the government, yet in this case there seems to be no probability that private capital will be forthcoming for the purpose of laying a Pacific cable without a very large subsidy from the government. If government assistance in some form or other is necessary, absolute government ownership and control is much to be preferred to that of a private company working under a government subsidy. Among the arguments that may be brought out in support of this proposition, which is set forth in the British committee's report, are:

"(1) Notwithstanding the proposed British cable will enter a field already occupied by British-owned and subsidized cables, and with which it will compete for business, the committee declares in favor of government ownership for the new cables. This proposed cable will not come in competition with any established American interests, except so far as the American trans-Atlantic lines share in the existing traffic between the United States and the Orient. On the other hand, these same lines will secure a new and increasing business by sharing in that portion of the traffic between Europe and the Orient which will be carried by the Pacific cables.

"(2) Cheap cable tolls, probably one of the greatest inducements that could be furnished by the government to attract capital in the development of our island possessions, might not be secured through a subsidized company, even though the rates are prescribed by law. Collusion with other cable companies, for the purpose of diverting traffic from the American cable, would make it possible for a subsidized company to show less receipts and thereby increase its subsidy.

"(3) It would be many years before the traffic would justify the construction of a competing cable, and in that time the subsidized company might become a part of a cable combination or trust, and thus deter any independent private corporation from attempting to compete with it.

"(4) There can be no doubt that a greater efficiency of a cable would be secured under government operation. The aim of the department controlling it would be to handle all the traffic the cable could carry. The aim of a private company would be to make the most money possible, even if by so doing the cable was idle much of the time, as is now the case with many existing cables.

"(5) In time of war private ownership would be of no advantage If our own country were involved in war the fact that the cable was private property would not prevent the enemy from cutting it. In case of war between other countries government ownership might save a cable from injury, for the reason that a government is in a position to guarantee to belligerents that neither shall secure an advantage over the other in the use of a cable."

The present commercial rate from Washington to Manila is $2.38 per word and the government rate is 13 cents per word less. The government at present pays $325,000 per year for the transmission of its messages to the Philippines, and it is reasonable to expect that this business will increase rather than diminish. The gross receipts of the Atlantic cable companies are placed at $10,000,000 per annum, and it is a fair assumption that the next fifty years will see as great a development in the trade of the far east as there has been in the comparative past. Gen. Greely of the war department thinks that the revenue from the Pacific cable immediately after construction would be sufficient to maintain, operate and repair it.

NAVAL MATTERS.

Paymaster Alfred E. Bates, Major H. S. Kilbourne and Major J. M. Carson sent out from Washington as a special board to inspect the hospital ships Missouri and Relief, have decided that the Missouri is unfit for hospital use and notified the quartermaster's department that she is turned over to it for disposition.

Rear Admiral Endicott, chief of the bureau of yards and docks, has submitted an estimate, $80,000 in amount, for work undertaken at various yards and stations, the cost of which was intended to be met by appropriations for the current fiscal year. The additional money is required on account of the increased cost of material, principally steel, since the original estimates were made.

The Japanese battleship Asahi, which was described in last week's Review, and which is the largest of Japan's battleships, ran aground at South Sea in the English channel just after leaving Portsmouth harbor. A number of tugs started to pull her off but were unsuccessful in their efforts.

The schoolship St. Mary's, carrying 100 young Americans, who expect within two years to become navigators, left for a cruise half way round the world this week. The boys will be given an opportunity to see the Paris exposition. The schoolship will return in November.

The Nickel Plate road offers special low rates to Milwaukee, Wis., account biennial meeting General Federation of Women's Club. Tickets sold June 1 to 4 inclusive; good returning until June 11, or by deposit until June 30 inclusive. Call on or address E. A. Akers, agent, Cleveland, O., or C. A. Asterlin, T. P. A., Ft. Wayne, Ind. 68, June 4.

AMONG SHIP BUILDERS OF THE LAKES.

All manner of rumors are heard relative to a large number of vessels of Canadian canal dimensions to be built by the American Ship Building Co. for lake and Atlantic service. These rumors have reference to the fleet that is to be constructed under the direction of Mr. A. B. Wolvin of Duluth, who has already placed an order for at least four of the vessels. One of the directors of the ship building company is quoted as saying that the final order, when certain financial arrangements now under way in New York are completed, may be for forty such vessels. There is no question of the ability of the consolidated ship yards to undertake such an order and very probably complete the forty vessels (of 3,500 tons capacity on 18 feet draught) within two years if necessary. It is known that the principals of the American company have important negotiations of this kind under way, but there will probably be no definite information available until an official announcement is made. Work on the big ore carriers building for the Bessemer Steamship Co., Carnegie company and others is now progressing very rapidly. The steamer Gen. O. M. Poe, just completed at Cleveland for the Bessemer company, will very probably get away on Saturday of this week. The second of the 500-foot Wolvin steamers built at Lorain, which is named J. J. Hill, is also about ready to go into commission. One of the two Wolvin steamers of this same type building at West Bay City is scheduled to leave the ship yard before the 15th inst, and the other is to follow shortly afterward. Two other steamers for the Bessemer company (Rockefeller), one building at Chicago and the other at West Superior will probably not be completed until about June 15. Officials of the Carnegie company are hoping that all six of their ore carriers, five steamers and one tow barge, will be completed about the middle of August. The tow barge, which is building at Chicago, will probably be the first of this fleet to go into commission.

The Bertram Engine Works Co. of Toronto is engaged on plans for the steamer similar to the Toronto that is to be built for the Richelieu & Ontario Navigation Co. The vessel's length over all will be 290 feet; breadth of hull, 36 feet; depth of hull, 14 feet; draught of water, 8 feet 6 inches. She will have triple expansion engines fed by four boilers of Scotch type and will be designed for a speed of 17 miles an hour. She will be constructed largely of steel.

In connection with the announcement that R. O. & A. B. McKay of Hamilton, Ont., are bringing over from England two new steamers to engage in the ore trade between the head of Lake Superior and Hamilton, it is also announced that the new steel works of the Hamilton Steel & Iron Co. will be in operation shortly. The two new open hearth furnaces have been finished and in one of them there is already a drying out fire. The furnaces will be ready to be charged about May 1 and their capacity will be about 90 tons a day.

A tug 35 feet long and 8 feet beam is being built at Lundy & Carter's ship yard, Ludington, Mich., for the Carter Lumber Co.

AROUND THE GREAT LAKES.

Major Symons, United States engineer at Buffalo, will open bids May 21 for the construction of a concrete superstructure on the south pier at Buffalo.

Captains of vessels owned by W. P. Rend, coal dealer of Chicago, are: Steamers—G. G. Hadley, Capt. M. Fitzgerald; Panther, Capt. Matt. Smith. Schooner—Massasoit, Capt. W. J. Fitzgerald.

Mr. C. A. Macdonald of Chicago, well known in connection with the insurance business of the lakes, says there is no truth in the report that he is at the head of the syndicate that was said to have about completed arrangements for the purchase of the property of the Miller Bros. Dry Dock Co., Chicago.

Owing to the retirement of J. H. Outhwaite, the partnership of J. H. Outhwaite & Co., ore dealers of Cleveland, composed of J. H. Outhwaite, W. G. Pollock and W. H. Becker has been dissolved. There is nothing of special importance about this announcement. Mr. Outhwaite has not been active in the firm of J. H. Outhwaite & Co. for several years past. Affairs of the Pittsburg & Lake Angeline Iron Co., which have been conducted in the office of J. H. Outhwaite & Co., will continue in charge of Mr. W. G. Pollock, secretary and treasurer of that company, and Mr. Becker, occupying with Mr. Pollock the offices in the Western Reserve building formerly occupied by J. H. Outhwaite & Co., will have his own interests to look after, as well as other matters in which he will be assisting Mr. Pollock.

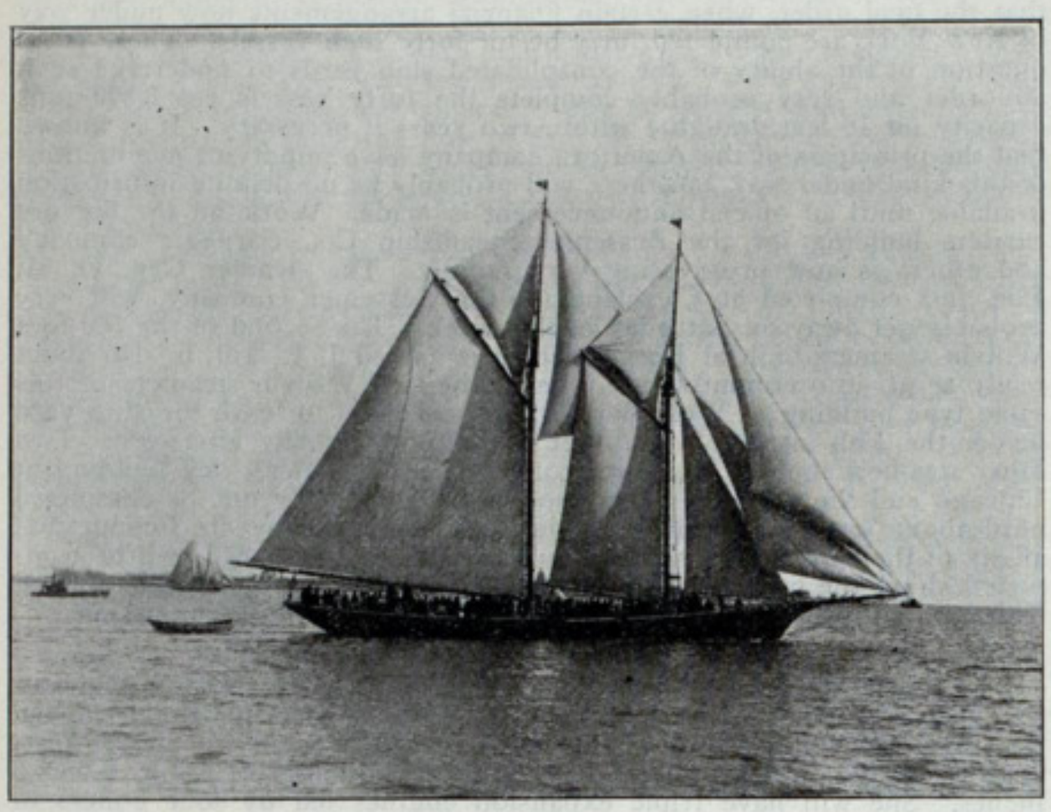
Col. G. J. Lydecker, United States engineer, opened bids in Detroit Monday for several extensive jobs of dredging in the St. Clair and Detroit rivers. Section 1, on the Grosse Pointe south channel range, requiring the removal of 98,000 cubic yards of rock, went to the Buffalo Dredging Co. of Buffalo, at $4.74 a cubic yard; section 2, in the Limekiln crossing, 86,000 cubic yards, James B. Donnelly, Buffalo, at $2.27 a cubic yard; section 3, on Bois Blanc and Amherstburg ranges, 64,000 cubic yards, G. H. Breyman, Toledo, $1.17 per cubic yard; section 4, in front of Amherstburg, 48,000 cubic yards, M. Sullivan, Detroit, at $4.70 a cubic yard; section 5, Hacket range, near Amherstburg, 10,000 cubic yards, Samuel O. Dixon, Milwaukee, at $1.35; section 6, Hacket range, 61,000 cubic yards, Ed. J. Hingston, Buffalo, at $4.50.

MEETING OF THE MARITIME LAW ASSOCIATION.

The annual meeting of the Maritime Law Association of the United States will open on Friday of this week in the building of the Association of the Bar at New York. Delegates will be elected to the international maritime conference to be held in Paris in October. Following are the topics to be discussed: The agenda proposed for the Paris meeting; preliminary acts in collision suits; the proposed revision of revised statutes of the United States transferring the jurisdiction of the circuit court to the district courts and its effect upon the trial of admiralty and maritime causes; a general and uniform regulation of liens in favor of material and supply men, both foreign and domestic, by act of congress; an act to confer jurisdiction on the United States courts of suits in admiralty against the United States for negligence of national vessels; some regulation by act of congress of the right of action for loss of life caused by negligence at sea.

SCHOONER HELEN MILLER GOULD.

A picture of Capt. Jacobs' schooner, the Helen Miller Gould, which was launched from the ship yard of John Bishop at Gloucester, Mass., about a month ago, is presented herewith. The photograph was made by Frank Holt. Helen Gould consented to have the vessel christened with her name and the launching was made a gala event. Thousands of persons, including many dignitaries of the state, gathered to see the ship



THE HELEN MILLER GOULD.

leave the ways. The principal dimensions of the schooner are: Length, 128 feet; beam, 25 feet 4 inches; bowsprit, 31 feet 6 inches; mainmast, 80 feet; foremast, 74 feet; main topmast, 42 feet; fore topmast, 40 feet; main boom, 71 feet. She is fitted with an auxiliary gasoline engine of 35 horse power. It was intended to fit her with a 130 horse power engine, but it was not ready at the time of the launching. She will be equipped with this engine as soon as it is completed.

REAR ADMIRAL O'NEIL ON THE DOUBLE TURRETS.

Rear Admiral O'Neil, naval chief of ordnance, makes this statement in regard to the double-decked turrets of the Kearsarge:

"Since the preliminary trial of the Kearsarge's guns and turrets, my opinion has frequently been asked as to the conclusion to be drawn from such test. In reply I would state that while I am gratified at the good results shown by the first trial of the same, it is not different from what I expected. I did not suppose for a moment that the turret structure or the vessel would prove deficient in any respect, as both have been carefully and conscientiously worked out by the bureau of construction and repair, as have also the various mechanical difficulties which the scheme presented. The fact that no inconvenience was experienced by the occupants of the upper or lower turrets, due to the firing of the guns above or below them is interesting and important, as there were some doubts upon this point, and I was somewhat apprehensive lest the blast and flame from the 8-inch guns might inconvenience the men in the sighting hood of the lower turret, and I am pleased to learn that such was not the case. It will be necessary, however, to determine what will be the result of rapid and prolonged firing, and further tests, under varying conditions of weather, at sea, are desirable. It will be interesting to ascertain what the effect, if any, will be on the turning gear if the two right or left hand guns only are fired simultaneously, and what effect the independent firing of the four guns in one structure will have upon the accuracy of aim and rapidity of fire of each.

"So far as the mechanical and structural designs are concerned, there is no doubt in my mind that they can be and are satisfactorily met. In other words, it may be said that it is shown that we may, if we choose, build battleships with respect to their turrets in this manner, but the vital question is: Do we want to? or is it desirable to do so? There will always be a difference of opinion on this point. The advocates of the system will point out that by means of it two 8-inch turrets containing four guns will be practically the work of four turrets containing eight guns, thereby resulting in a great saving of weight; that the ammunition hoists of the 8-inch are better protected; that there is no interference in gun fire, and that a heavy concentration of fire is obtained by mounting four guns in one revolving structure.

"On the other hand, it will be argued that it is not good practice to put four guns in one structure when two of them are of different caliber from the others, having a different speed of firing, range and energy; that all are dependent upon one turning engine, whose derangement means the putting out of action of a large percentage of the battery; that one man points four guns and that his personal error or equation is too far-reaching; that the concentration of weight toward the extremities of the vessel is undesirable, and that any serious injury to either the upper or lower turret will put four important guns out of action. In fact an agreement will never be reached on these points and I doubt if any absolute proof of the value of this or of any other system can be determined except in battle, where ships of fairly equal powers are pitted against each other.

"The Kearsarge and Kentucky like the Alabama and Maine classes, could probably go through many years of service, having their regulation gun practice and show no signs of weakness or inefficiency. Their turrets would revolve and their guns would work as well at the end of ten years as at first, and it would be impossible to say that either would fail or prove superior to the other, except by actual test in war, and even then the element of chance is so great that it would be an important factor whose value could not be determined. The question, therefore, whether or not the system of superimposed turrets should be adapted for the new battleships is by no means easy of solution. It will have to be carefully considered, and a consensus of opinion obtained from a number of people whose judgment in such matters represents the best talents in the navy. No one person will or should determine so important a question, and it will not likely be determined until the Kearsarge and Kentucky have been thoroughly put through a series of extended tests. In the meantime the country may congratulate itself upon the possession of two unique and remarkably fine and powerful vessels, which from all accounts reflect the highest credit upon the builders and designers."

THE JAPANESE NAVY.

In a paper on the Imperial Japanese navy, read recently before the Institution of Naval Architects (British), Rear Admiral C. C. P. Fitzgerald said:

"The rise and development of the Japanese navy is probably without precedent in the world's history. When I visited Japan for the first time 1858 the navy consisted of some junks and a few ships which were said to have been built and rigged on the models of Dutch ships of the seventeenth century, and they certainly looked like it. The first real start made by Japan in the production of a modern navy seems to have been the purchase of the ironclad Stonewall Jackson from the United States government in 1866. There can be no doubt that the Chino-Japanese war gave an immense impetus to the development of the Japanese navy; not only were ships captured from the Chinese, some of which were repaired and are now in commission, but large orders were placed abroad for warships of all classes, including torpedo craft, and the Japanese also set to work to build ships in their own dock yards."

Eliminating ships which appear to be of insignificant fighting value, Japan has seven first-class battleships in the fullest sense of the term, and has or is building six very powerful armored cruisers equal to vessels classed elsewhere as second-class battleships. Then there are ten unarmored cruisers, second-class, beside third-class cruisers, torpedo boats and small craft. There are three Imperial dock yards in Japan—Yokosuko, Kure and Sassebo. They are all capable of being effectually defended. A fourth, Maisuru, on the northwest coast of the main island, is also in course of construction. Up to the present the Japanese dock yards have not undertaken to build a battleship, and the largest cruiser they have built is the Hashidate, of 4,200 tons and 16 knots speed; but they hope soon to be able to build first-class cruisers at Yokosuko, and eventually battleships. At this dock yard there is a first-class modern dock, on which one of the heaviest battleships in the British navy—the Victorious—was lately docked for cleaning purposes. "I never saw," said Admiral Fitzgerald, "a similar operation more quickly, more quietly, nor more methodically performed in any English dock yard."

From the first awakening of Japan her statesmen seem to have grasped the fact that it would be useless to have a modern navy on the European model without having officers and men trained to work it; and, as it takes longer to train men than to build ships, they started at a very early stage to make provision for the training of their personnel. Concluding, Admiral Fitzgerald says:

"The marvelous power of assimilating new ideas and new methods, entirely foreign to all their national traditions and the practice of centuries, which the Japanese have exhibited during the last few years, is a subject which has frequently been commented upon; but only those who have seen their ships in commission, and visited their dock yards in working hours, can fully realize the significance of the wonderful strides they have made during the comparatively short period which has elapsed since they set to work to create and to maintain a modern navy. Their zeal, their earnestness, their close attention to small but essential details, as well as their power to grasp broad principles, must be seen to be appreciated. I have heard it said that the Japanese are mere imitators, that they can copy European ideas and methods up to a certain point, but that they have no initiative, and that if they ever have to engage in hostilities with a western naval power where unforeseen conditions of strategy and tactics may arise, they will break down under the strain, and prove to be unequal to the task. That is not my opinion; and, although this is not the proper place to discuss politics and strategy, I venture to predict that when any future disturbance of the peace shall occur in the far east Japan will not only have something to say in the matter, but will make her voice heard and respected."

A grand naval review is to be held in Japan, commencing in April. It is intended more for mobilization purposes than for mere display. The entire naval forces of the country will be in commission, divided into two fleets, comprising in all about forty-four ships, to which must be added the torpedo boat destroyers and torpedo boat flotillas. After the maneuvers are over the emperor will inspect the fleet.

SHIP YARD PLANNED FOR TEXAS.

Articles have appeared in nearly all the newspapers of Texas within the past few days relative to a visit of Mr. W. I. Babcock of Chicago, president of the Chicago Ship Building Co., to Port Arthur, Texas, with a view to examining the location and facilities to be had there for extensive ship building yards. The dispatches refer to the undertaking as one in which John W. Gates, chief promoter of the Kansas City & Southern railway, is interested. The Houston Post says:

"Mr. Babcock was shown over the grounds, water front and canal by George M. Craig, local manager, who explained in detail the plans for the new ship yard, which will constitute one of the greatest enterprises in the south. The ship yards will cover an area of seventy to eighty acres of ground and will comprise four berths for building vessels, so that four ships can be under construction at one time. These berths will be large enough to meet any possible demands of the future and will admit of the building of vessels 1,000 feet long if desired. The plans also include dry docks for cleaning and repairing vessels, slips for finishing new ships, etc. Of course, the works will also include a large foundry and machine shop and all the other accessories of a modern ship yard The ship yards designed for Port Arthur when in full operation will employ 1,500 men."

Mr. Babcock since his return from Port Arthur has said that he went there to look at the place, but that there is nothing tangible about the undertaking as yet; probably nothing will result from it. The government is spending a large sum of money in the improvement of Sabine Pass, the district in which Port Arthur is located.

BOILER COMPOUND QUESTION.

A DISCUSSION RELATIVE TO THE ACTION OF SODA ASH, CAUSTIC SODA, ETC.—INTERESTING LETTER FROM MR. W. H. EDGAR, PRESIDENT OF THE DEARBORN DRUG & CHEMICAL WORKS.

Mr. F. Elmo Stimpson of Chicago, president of one of the branches of the National Association of Stationary Engineers, a short time ago requested Mr. W. H. Edgar of the Dearborn Drug & Chemical Works to answer certain questions relative to the action of soda ash or caustic soda on steam boilers. Knowing that his answer was to be read at a meeting of the engineers who were giving some study to this branch of chemistry, Mr. Edgar entered into the subject very fully. He said:

"We have caustic soda, which is commonly known as concentrated lye (sodium hydrate); soda ash, which is carbonate of soda and when in crystal form is known as sal soda or washing soda; bi-carbonate of soda, which is the same as carbonate of soda except that it has only one-half the quantity of soda, the other half being displaced by hydrogen; sulphate of soda, which is commonly known as Glauber's salts; chloride of soda, which is table salt; nitrate of soda, found in large quantities in South America and used as a fertilizer, and also in obtaining or producing saltpeter; flouride of soda, which is the combination of hydro-flouric acid and soda; phosphate of soda, which is the result of the phosphoric acid and soda; and so we have a soda base combined with these acid radicals, forming the different salts of soda. All salts of soda are soluble in water (especially in hot solutions) and do not, nor will not precipitate out of solution until the solution becomes saturated so that it will not hold a larger quantity in solution, when the salt of soda will then cake at the bottom or hottest parts of the vessel. Sodium salts are not volatile nor will they evaporate or carry over as a gas by d stillation or sublimation. So you will readily see that the soda found in the condensation in the engine cylinder and through the steam system, does not volatilize and carry over or pass over by itself; it is carried over mechanically and not chemically or physically, which I will explain later on.

"In answer to your first question it may be said that if the steam is perfectly free from moisture when delivered from the boiler, it will not contain nor carry any soda, as it is the moisture that holds or contains the soda salt in solution, and if this moisture is left behind we also leave all trace of soda behind. Your second question is: 'If one pound of soda (that is caustic, sal or soda ash or, we may say further, any salt of soda), be dissolved in a given quantity of distilled water and the water boiled and evaporated what remains?' The answer is that your entire amount of soda would remain; there would be no loss whatever. You would recover all the salt you had in solution except careless as boiling caused the water to be spattered out of the dish; of course all solid body of moisture spattered and lost would contain just so much soda. This is the only possible way in which you could lose any part of the salt you had in solution.

"It may be stated further that the term 'salt' means the combination of an acid radical and a base, the two forming a neutral salt. Soda combined with different acid forms sodium salts; lime combined with different acids forms lime salts; and the same with magnesia or any other base, as when combined with corresponding acid radicals they form neutral salts, named to correspond with the acid radical with which the base is combined. You understand that soda ash is washing soda, what is used to make soap. Soap is also made with caustic soda. Soap is the result of the action of the soda base combining with the fat or oleic acid, forming oleate of sodium. This gives us soluble soap. The carbonic acid gas, combined with the soda, is carbonate of soda or soda ash; or the hydrate combined with the soda as caustic soda is easily and readily displaced by the oleic acid, the soda having a greater affinity for the oleic acid than it has for the carbonate or hydrate radical. This is called saponification. You know very well what soap would do in the boiler; you know its action in the water; it forms a suds; it foams. Now, the soda has the same action on the water without grease or soap. We do not, nor can we, get this action from a chloride of soda, a flouride or a nitrate of soda. These three—chloride, flouride and nitrate—belong to the same group; their physical and other peculiarities are very similar. Combined with soda, the affinity between the soda and these acids is so great that it will not break up to go to another acid radical; consequently we cannot saponify the water and cause consequent foaming by the use of these salts nor by use of phosphate or sulphate. But a sulphate will give off to some extent, softening the water by breaking up into a hydrate when in a boiling solution.

"Now, when you use caustic soda or soda ash, introducing the same into your feed water, you saponify the water in your boiler, causing it to foam, little bubbles to form, which break up and spatter the steam, and the water being more sudsy, the steam is spattered that much more; and these little, minute, solid sheets of water are virtually blown over. The great velocity with which the steam is leaving your boiler carries this moisture over mechanically and when you have soda in solution it is natural that any part of that solution carried over will take over just so much soda. Any grease or dirt that may be in your boiler or water will form just so much more or will cause just so much more of this saponifyable condition, causing more violence or perceptible foaming.

"Soda ash or caustic soda carried into the cylinder of the engine cuts the cylinder oil, forming soap with the animal or vegetable part of the cylinder oil, and mechanically coagulating into a sticky, non-lubricating mass the mineral part of the cylinder oil. Thus your lubrication is destroyed. The same action takes place in a boiler where you have oil coming back in the returns. Soda carbonate and soda hydrate saponify the animal oil, forming soap, which gives you violent foaming. It cuts and coagulates the mineral oil into a mass.

"A word on oils. Where you are constantly buckling the tubes in a water tube boiler, or bagging the sheets in a tubular boiler, or where the back ends of the tubes of a tubular boiler are constantly leaking, it is due to oil coming into the boilers with the returns. The animal or vegetable oil, combining with the lime and magnesia as oleate of lime and magnesia (most of the lime and magnesia being in the form of a carbonate), the carbonic acid is readily displaced by the oleic acid. These oleates of lime and magnesia are insoluble, because the oleic acid has combined with an insoluble base. This oleate of lime is formed on top of the water in little globular masses. These little particles are very adhesive and sticky; they gather together, forming into a mass and then become of gravity equal to the gravity of the water and are carried buoyantly with the circulation. They adhere mostly around the beads of the tubes or in the lower water tubes, because this substance has a greater affinity for the hotter metal than for the cooler parts of the boiler. Being a perfect non-conductor of heat it concentrates and checks the heat in these parts, preventing the water from absorbing the heat units. Then the metal is brought up to such a degree of heat that it melts, the pressure within forcing the metal out and buckling the tube or forming a bag. The mineral oil combines with the lime and magnesia as a mechanical mixture in a coagulated, sticky mass, incorporating with and forming a part of the general mass, all of which is insoluble and very adhesive.

"This mechanical mixture is also formed with common salt (chloride of soda), or the flouride or the nitrate of soda. Any one of these three will form a more sticky, tenacious, adhesive, coagulated substance mechanically with the oil (both mineral and animal) and in a hot solution far worse than the combination with lime or magnesia. This is formed because the affinity between the flourine, nitrogen and chlorine with a soda is so great that it does not break up but enters into a mass with the oil; so wherever you may be getting a little oil back in your returns, a flouride or chloride of soda will cause your boiler to leak and bag more quickly and the action is more vicious than the action with lime. When we say lime, we mean the natural scaling salts in your feed water. Now, where you are using the average feed water you have carbonate of lime and sulphate of lime, which form scale. And when you use soda ash it is for the purpose of furnishing carbonic acid or carbonate to give you a double salt, or enough carbonate to make your lime soluble as it originally was in solution as a bicarbonate ("bi" meaning two of the acid and one of the base). But you will readily see that you have your soda in solution, consequently you get the soda action, foaming, etc.

"Hydrate is used because lime salts are soluble in an excess of the hydrate, but this excess gives you the same trouble. Chloride of soda has no action on the lime, as the chlorine has a greater affinity for the soda than it has for the lime. Flourine is introduced with the object of converting the lime carbonate and the lime sulphate into flouride of lime, which is flocculent light precipitate. But you will readily see that where your flouride goes to your lime your soda goes to the carbonate with which the lime was combined and leaves the soda ash in solution; so that at the end of two weeks or one month's run your solution in the boiler is saturated with soda ash. Then you get a soda action, your water is saponified and carries over, your valves and connections are all eaten out from the same old soda action. Then again the flouride of lime, which is formed and which would remain as such in a cool solution, is taken up to a great extent in a hot solution, due to high heat in a steam boiler, which the average chemist does not stop to figure and think of. When this flouride of lime breaks up you get the oxide of lime and free hydro-flouric acid. The hydrogen of the water combines with the flourine, forming hydro-flouric acid; and the oxygen of the water goes to the lime, forming oxide of lime. This hydro-flouric acid liberated, attacks the metal and eats the iron, it being much more corrosive and vicious than even sulphuric acid. The oxide of lime forms a scale just as readily as the carbonate.

"Soda is so extremely cheap that the fakers can afford to sell any preparation of soda and make a thousand per cent profit; and the prices that they get are such that all they need to do is to sell one or two kegs per week. They care not for your boilers, and if they did their knowledge would not help them out. They know nothing about the article they are selling but they talk in the same strain that has attended the sale of all soda dopes for the last twenty or thirty years. If you are going to use soda, buy your own. Phosphate of soda, whether it be tri-sodium phosphate or the other soda phosphates, is used with the same purpose in view, namely, that of converting the lime carbonate and the lime sulphate into phosphate of lime, known as or claimed to be tri-calcium phosphate. But you will readily see that the phosphate going to the lime, the soda must go to the carbonate, sulphate or hydrate; and you get the same action with the same results, the soda ash being left in solution. You will notice that they all explain to you the action on the lime but they do not tell you what becomes of the soda. The man who is selling it does not know. The chemist who got it up does know but he takes good care that you do not know through any fault of his.

"When a water is too pure and does not contain lime or some proper substance (such as the return condensation or distilled water), it attacks the iron. The action is termed electrolysis—more commonly speaking, galvanic action. When you add soda to the too-pure water—enough soda so that you have an excess of same over the lime—you then have a water too pure, an unsatisfied water, which immediately acts as the electrolyte between your poles, giving you the battery connected and your positive pole, which is always the iron, is destroyed. Then you have pitting, grooving, etc., and general action on the joints and connections takes place. The only salt of soda that can be successfully used is the tannate of soda, and then only when used with four times its weight of tannin; also with a large excess in weight of sugars, mixing the sugars to handle the sulphates and the tannings to handle the carbonates. These mixtures can be used without any foaming or deleterious action to the iron.

"This is a subject in organic chemistry all by itself. You can buy these substances at the wholesale drug store. The reason these soda dopes and soda salts have been used so extensively throughout the country, in the face of the fact that the joints are all leaking and you have the steam connections clamped up with leak protectors, is the fact that the consumer has been under the persuasive power of salesmen whose business is to talk nonsense and keep the engineer worked up on alleged theory. Engineers should read chemistry; figure out the reactions and remember that there is always a bi-product and a main product, and when the main product is figured out we must be sure to figure what becomes of the bi-product. When we take we must give in all chemical reactions. We must take and if we do not give we must produce."

The Nickel Plate road will sell low rate excursion tickets to North Manchester, Ind., account annual meeting of German Baptists (Dunkards) at one fare for the round trip. Tickets good going on May 29 to June 4 inclusive, beyond a radius of 100 miles, and on May 31 to June 8 within a radius of 100 miles from North Manchester, Ind. Good returning until June 10, or by deposit until July 5 inclusive. Call on or address E. A. Akers, agent, Cleveland, O., or C. A. Asterlin, T. P. A., Ft. Wayne, Ind. 67, June 4.

MARINE REVIEW

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The naval board of construction has practically approved the plans for the three battleships, Pennsylvania, New Jersey and Georgia, authorized by the last congress, and will forthwith have specifications prepared preliminary to calling for bids from the ship builders. The designs in general do not differ from those originally planned. The only question that may be said to be open for discussion is the arrangement of the batteries, and that, indeed, is subject to change at any time. Rear Admiral Bradford is strongly in favor of the superimposed turret and will bring it to the fore if possible. It is extremely unlikely that any subsequent action will be taken in favor of the superimposed system, as Rear Admiral Melville is the only member of the present board whom Bradford could bring to his support. As the circular now stands it provides for a main battery of four 12-inch guns in two ordinary turrets, eight 8-inch guns in four ordinary turrets, two on each beam, and broadsides of twelve 6-inch guns. The biggest guns in the secondary battery under the arrangement are 14-pounders, corresponding to 3-inch rifles. As the speed to be secured is 19 knots, the ships, to carry the armament and such massive engines, will require a displacement of 15,000 tons and will be by far the largest in the navy. It is expected that they will be about 440 feet long.

The ocean-going tramp steamship is nomadic. It is the gypsy of the ocean. It has a local habitation only in name. It goes here and there and everywhere, and may indeed never return to the port from whence it started. Its home is really for document purposes only. But unlike the human nomad it has a fixed purpose in life. It was designed to make money and it makes it where it sees it. It may take coal from Newcastle and spices from Egypt. It will discharge a cargo wherever it is bidden and pick one up wherever it can. While for convenience it usually flies the Union Jack, it is catholic in its obligations and will work for any nation. Its business is to carry freight and it will cheerfully run errands for anyone who has the wherewithal. Every merchant marine must have its tramps. They are essential to the development of trade. Two of them are now being constructed at the yards of the Maryland Steel Co. and more some day will follow. The time will surely come when the United States merchant marine will have its quota of tramps, not only to carry its own freight but to compete as carriers for the common commerce of the world.

When Stephenson told parliament that he believed locomotives could be constructed to run upon rails at thirty miles an hour they laughed at him. Parliament said that it was impossible. Experts produced long calculations to prove that it was impossible for a horse ever to cover a mile in two minutes. Both parliament and horsemen were wrong. Twenty-five years ago the foremost authorities on steam navigation declared it to be impossible for any steamship to stand the strain of crossing the ocean at twenty-five miles an hour. Elaborate calculations supported the statement. Yet twenty-five miles an hour today is not regarded as extraordinary. It is practically the schedule of one of the ocean liners. The Deutschland which is to make its maiden trip next month is scheduled to cross at the rate of 23 knots per hour which is about 27 miles.

It has been suggested to the navy department to construct a most novel vessel for naval reserve purposes on the Great Lakes. The vessel proposed is a gunboat of not more than 500 tons with a minimum draught for that displacement. It would be mounted with every type of rapid fire and other guns of the navy, so that at the end of a season's cruising the crew would be well versed in gun fire. The treaty of 1817, which prohibits the presence of more than one armed vessel on the lakes, would be overcome by taking out for drill purposes only two or three guns at a time. This would merely entail the transfer of guns from shore to ship.

The office of naval intelligence has just issued the fourth edition of the compilation on "Coaling, Docking and Repairing Facilities of the Ports of the World"—a most exhaustive treatise of a series of analyses and tests of different kinds of coal together with the average supply at docks and coaling stations. The information was gathered by the United States cruising vessels.

The house committee on rivers and harbors has decided to report favorably the resolution to authorize a survey of the Illinois and Desplaines rivers for the purpose of establishing a deep waterway from the lakes to the Mississippi. Carried to its conclusion this would realize the hope of Chicago for an all-water route to the gulf and the ocean.

NEWS FROM BOTH COASTS.

MAINLY AN ACCOUNT OF WHAT THE SHIP BUILDERS ARE DOING—LAUNCHES, TRIAL TRIPS, NEW ORDERS, ETC.

The Boston & Philadelphia Steamship Co.'s new Grecian has just been given her trial test and it was in every way satisfactory. Her principal dimensions are: Length, over all, 200 feet 4 inches; beam, molded, 42 feet; depth from center to hurricane deck, 36 feet; displacement at 17 feet mean draught, 3,175 tons; gross tonnage, 2,827; coal bunker capacity, 293 tons. This steamer has four watertight compartments, steel pole masts, steel hull, three steel decks and one of partial steel construction. The engine is triple expansion with cylinders of 25, 41½ and 68 inches diameter and 42 inches stroke, built for a working steam pressure of 170 pounds. Her speed at sea, loaded, will be fifteen knots. The Harlan & Hollingsworth Co. of Wilmington, Del., were the builders and the work of construction was superintended by Capt. P. A. Nickerson, who will be in command. Accommodations are provided for 120 first-class passengers. All staterooms are outside rooms.

The Havana Dry Dock Co., which is constructing a dry dock in Havana at an approximate cost of $400,000, has recently given out a number of important orders for structural machinery and equipment. The Benedict & Burnham Co. of Waterbury, Conn., has secured an order for 1,600 copper sheets at a cost of nearly $10,000. The Hall Steam Pump Co. of Pittsburg has received an order for an 11 by 14 by 9 by 14 air compressor valued at $4,100. The S. A. Woods Machine Co. of South Boston, Mass., will furnish a large swing cut-off saw, and the Ritter-Conley Manufacturing Co. of Pittsburg will supply a number of riveting machines. Shipment of two 75-inch by 22-foot vertical boilers, valued at $6,500, will be made to Havana next week. The boilers were manufactured by Samuel Smith & Son of Paterson, N. J. The Housten, Stanwood & Gamble Co. of Cincinnati will at the same time forward an 18 by 26 engine, valued at $3,500.

Work on the monitor Connecticut, being built by the Bath Iron Works, Bath, Me., for the United States navy, will be completed in a month. The contract speed for the craft is 11.5 knots. It is calculated that fully fifty tons of fresh water can be carried in the double bottom compartments. The armor protection of the new craft will consist of an 11-inch belt on the hull, extending the full length of the vessel, tapering at the top to 5 inches and to 3 inches at the base. The turret armor will be 10 inches thick, while the conning tower will have 7 inches of armor and the protective deck 1½ inches. The launching of this vessel at the Bath Iron Works will be a gala occasion.

The Lidgerwood Manufacturing Co. of New York has received a $12,000 contract for the supply of three auxiliary engines which are intended to serve as part of the equipment for the three 10,000-horse power electrical dredges now being built to the order of the Queensland government at Armstrong, Whitworth & Co.'s ship yards, Newcastle-on-Tyne. The dredges, which are valued at $1,250,000, are being constructed under the designs of Lindon W. Bates of Chicago, who recently furnished an electrical dredge costing over $500,000 to the Russian government.

The Merrill-Stevens Engineering Co., Jacksonville, Fla., is turning out a great deal of work. The company lately launched the steamer H. B. Plant, designed for service in the shallow waters of Tampa bay and Manatee river. She is 127 feet over all, 120 feet keel, 21 feet 6 inches molded beam and 7 feet 6 inches molded depth. The company has also completely rebuilt the steamer Cocoa, which was one of the prizes of the Spanish-American war and was then known as the Argonauta.

Charles Fletcher of Providence, R. I., is having built at the works of the Harlan & Hollingsworth Co., Wilmington, Del., a steam yacht which will be one of the largest in eastern waters. She is from designs by A. S. Chesebrough of Bristol, R. I., and will be 212 feet over all, 25 feet 11½ inches beam and 16 feet 9 inches depth. She will be equipped with triple expansion engines of sufficient power to drive her at 14 knots. Mahogany and other hard woods will be used in her fittings.

Following were the bids received for the construction of a dipper dredge for the Chattahoochee and Flint rivers, in Georgia and Alabama: M. A. Sweeney Ship Yard & Foundry Co., Jeffersonville, Ind., $13,743; Rittenhouse Moore Dredging Co., Mobile, Ala., $15,000; Osgood Dredge Co., Albany, N. Y., $15,800; Petersburg Iron Works Co., Petersburg, Va., $25,837.

The steamer Northumberland, built by the Neafie & Levy Co. of Philadelphia for the Weems Transportation Co. of Baltimore, was given a trial trip last week and proved in every way satisfactory. Her length over all is 200 feet, beam 14 feet and depth of hold 12 feet 3 inches. A triple expansion engine and two steel boilers of the gunboat type are her power equipment.

Enoch Moore & Sons Co., ship builders of Wilmington, Del., have contracted to build ten derrick lighters for the Pennsylvania Railroad Company. They are to be built of white oak and each will be 80 feet in length, 28 feet beam and 9½ feet depth of hold. The vessels will be used for general freighting purposes around the port of New York.

The William Skinner & Sons' Ship Building & Dry Dock Co., recently held its annual election at Baltimore. Mr. Harry Skinner was chosen president and D. H. Miller, Jr., secretary. These officers and Messrs. Robert Ramsey, Henry Williams and George R. Heffner were selected as the board of directors.

The tug Buccaneer, built by the Atlantic Works, East Boston, Mass., for the Red Star Towing & Wrecking Co., made her trial trip down the bay a few days ago. She averaged 12½ knots per hour. She is 125 feet long and of 13 feet draught, with bunkers of 170 tons capacity, thus giving her a great steaming radius.

The Eastern Ship Building Co. of New London, Conn., has a force of men at work clearing the land at Groton, which has been secured for the ship building plant. Keels for the two steamers to be built at this yard, and which will be the largest in the world, will be laid within three months.

A gala event was made out of the launching of the steel tug John K. Cowen from the ship yard of the R. M. Spedden Co. at Baltimore a few

days ago. Miss Jane Huntress of Chicago christened the boat. The tug is 110½ feet long, 21 feet beam and 10½ feet depth of hold. Her engine is of the fore-and-aft compound type, with cylinders of 18 and 36 inches diameter and 26 inches stroke of piston, and will be supplied with steam from a steel Scotch return-tubular boiler, having three corrugated furnaces and tested to 150 pounds pressure. The boiler is 11½ feet in diameter and 12 feet long.

John H. Dialogue & Son of Camden, N. J., are building a tow boat for the Tice Towing Co. of New York. She is 135 feet over all, 25 feet beam and 15 feet deep. The tug Abram Minis for the Propeller Towboat Co. of Savannah, which is 138 feet long, is nearly completed.

Messrs. McKay & Dix, Bath, Me., are building for their own account two large four-masted schooners which they will employ on the general freighting trade. One of the vessels is well under way and the keel and frames of the second one are ready for setting up.

Keel is being stretched at the New England Co.'s yard at Bath, Me., for a 2,000-ton schooner for Capt. W. H. Potter of Orient, Long Island. She will be a five-master, will measure 250 feet keel, 46 feet beam and 21 feet depth. She will be finished early in the fall.

The Gas Engine & Power Co. of New York has forty-three light-draught launches now in its works, including new tenders for Com. Lewis Cass Ledyard's Corona, Lloyd Phoenix's Intrepid, Dr. W. Seward Webb's Elfrida and Commodore Gerry's Electra.

William Case of Newburgh, N. Y., has fitted up an extensive shop for repair and joiner work to wooden ships. His plant adjoins that of the Marvel Ship Building Co., where any necessary engine or boiler work may be made.

In the construction of the giant five-masted schooner at the yards of Percy & Small, Bath, Me., a trial is being given to the covering of the frames with a network of steel bands which is intended to give the vessel great strength.

Representative Mudd has introduced a bill in the house of representatives appropriating $1,200,000 for the construction of a naval dry dock at Drum point harbor at the mouth of Patuxent river, Chesapeake bay.

Secretary Gage has submitted to congress an estimate for an appropriation for a new light-ship for the Maryland district. The new ship is to replace the Bramble, which has become badly out of repair.

A new passenger propeller, the Cape Cod, building at Story's ship yard in Essex, Mass., for the newly-organized Boston, Plymouth & Provinceton S. S. Co., is about ready for launching.

Two barges, Norton and Sharon, for the Staples Coal Co. of Taunton, Mass., have been launched by Kelley, Spear & Co., Bath, Me. They are each of about 900 tons carrying capacity.

A new 50-foot tug boat, the George C. Van Tuyle, was launched from the ship yard of Paul Le Roux at Albany, N. Y., last week. She was built for service on the upper Hudson.

A new tugboat hull built by William H. Baldwin at New Baltimore, N. Y., for Capt. N. Smith, has been taken to Skinner & Arnold's shops, Albany, for her machinery.

Barge Hampshire with a capacity of 1,600 tons, built by Kelley, Spear & Co., Bath, Me., for the Davis Coal & Coke Co. of Philadelphia, was launched April 21.

The bid of Samuel J. Pregnall, Charleston, S. C., at $5,947 has been accepted for repairing the Charleston light vessel No. 34.

SHIPS FOR LAKE AND ATLANTIC SERVICE.

The plans appearing on this page show the type of steam vessel which Francis J. Clergue of Sault Ste. Marie, Ont., is bringing to the lakes from England for the purpose of moving iron ore from mineral lands which he is opening up at Michipicoten, just above the Sault. The plans are those of the steamer Gargantua, one of four vessels of like dimensions which are expected to pass up the Canadian canals to the lakes within the next month or six weeks. These steamers are each of about 2,500 tons capacity on 17 feet draught. Mr. Clergue says he has made arrangements to bring over from England next season four more vessels that will each carry about 3,200 tons on 18 feet draught. The Gargantua is 243 feet long between perpendiculars, 36 feet beam and 19 feet 5½ inches moulded depth. She has triple expansion engines of 19, 30 and 46 inches cylinder diameters and 36 inches stroke. Her gross tonnage is 1,578, and her cellular bottom has capacity for 350 tons of water ballast.

It will thus be seen that while ship builders and ship owners in the United States are figuring on the construction of a large number of vessels suited to both lake and Atlantic service, Canadian interests are also alive to the advantages of this kind of ship. As already noted in these columns, R. O. & A. B. McKay of Hamilton, Ont., also have two such vessels under construction in England and they will reach the lakes within the next few weeks. Mr. Clergue, who is well known as the leading spirit in extensive water power developments on both the Canadian and American sides of the Sault, says that when his vessels are through carrying ore in the fall he will send them to the Atlantic, very probably loaded with pulp from the large mills which he is operating by water power. They will be engaged in salt water service during the winter and return to the lakes again in the spring. The principal markets for pulp made at the Sault are in foreign countries.

A railroad to the iron mines near Michipicoten is about completed—the distance to water is only 12 miles—and Mr. Clergue says he will ship 500,000 to 700,000 tons of the ore before the present season is at an end. He bought the four steamers now coming over from England when he found the lake fleet was so generally under contract that vessels for immediate service could not be secured. Although none of the ore has been used in a furnace as yet, it is said to be a high-grade hard Bessemer hematite, readily available in great quantities, as it has simply to be blasted from a hillside and crushed by machinery that is already on the ground.

FROM PACIFIC COAST SHIP YARDS.

W. A. Boole & Son, ship builders of San Francisco, Cal., writing to the Review of their proposed ship yard and marine ways, to be built at Oakland, say: "We have contracted with H. I. Crandall & Son of Boston to furnish us with machinery for our marine ways with a capacity for lifting 3,000 tons. We expect to have the same in operation in the course of seven or eight months. We propose to engage in the work of building vessels, the first to be a four-masted barkentine of 225 feet length, 42 feet beam and 17 feet depth of hold. There is now a great demand for new vessels and we feel assured that the building on this coast is going to increase very materially in the next two or three years."

The Ohio Society of California is making great preparations for the launching of the battleship Ohio at Union Iron Works, San Francisco. A circular has been issued for distribution all over California, and if the hopes of the promoters are fulfilled the launching will be one of the greatest events ever witnessed in San Francisco. The state has been regularly organized into districts and an endeavor is to be made to have every Ohioan present at San Francisco on the day of the launching. The roster shows that there are 15,000 Ohioans in San Francisco.

The new tugboat Meteor, which is being built by the United Engineering Works of San Francisco, Cal., for the Alaska Exploration Co., was launched last week and is now ready to take in her machinery. She is 100 feet in length and will be fitted with double propellers.

Hind, Rolph & Co. of San Francisco have bought the American ship Emily Reed, the purchase price being $40,000. The vessel was owned by A. R. Reed of Waldoboro, Me., and is now on the way from Hong Kong to Puget Sound.

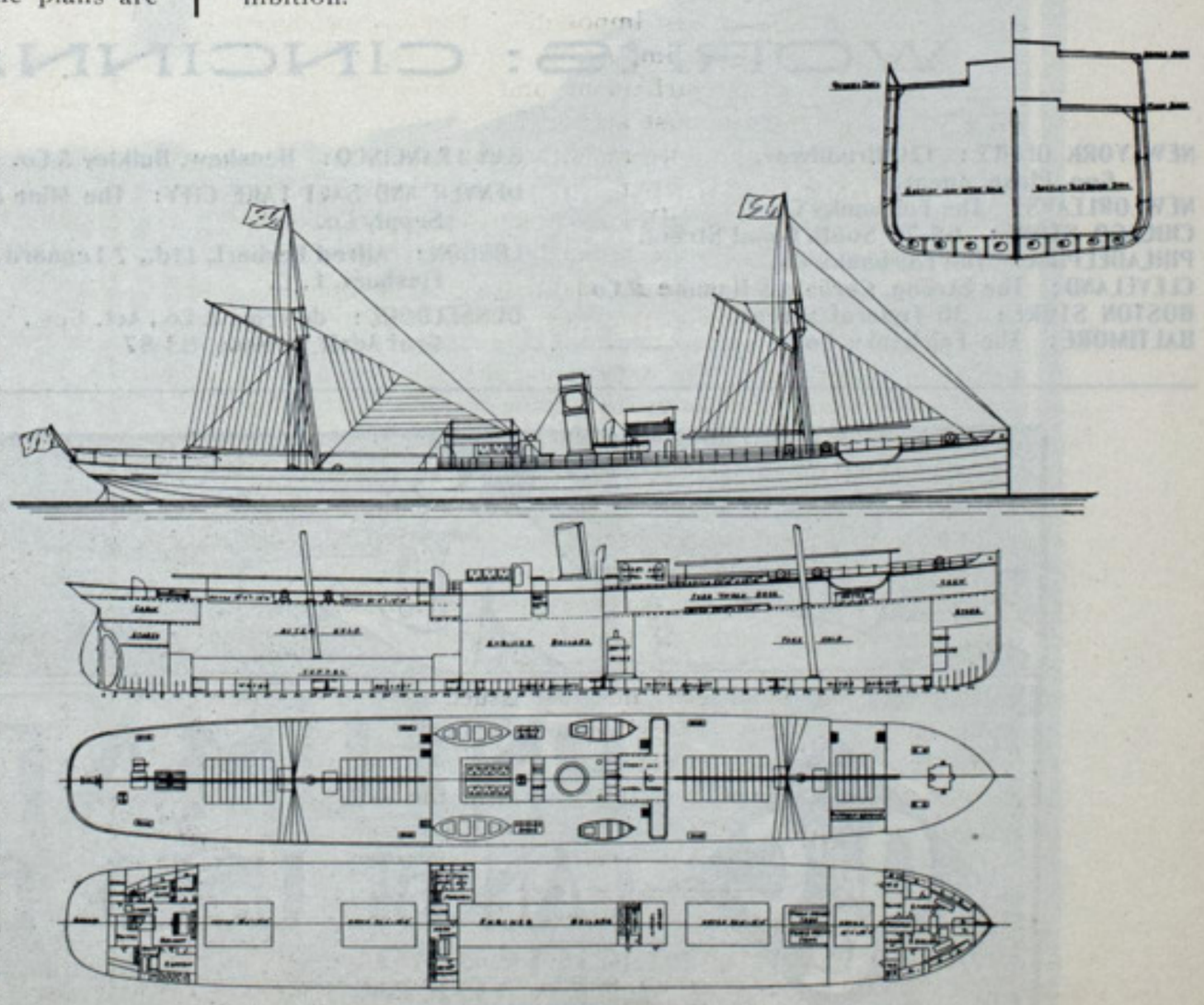
ASHCROFT SPECIALTIES.

The 1900 catalogue of the Ashcroft Manufacturing Co., 85-89 Liberty street, New York—a bound volume of 160 pages—is fresh from the press. It is complete in every detail and illustrates and describes the varied line of high-grade specialties manufactured and sold by this company. The business of this company was established in 1851 by the original manufacture and first introduction in this country of pressure and vacuum gauges. Many additions of meritorious devices have been added since. The Ashcroft pressure gauge, the Edson pressure recorder and alarm gauge, the Ashcroft revolution counter, the Keyser automatic water gauge, the Moscrop speed recorder, the Tabor steam engine indicator and many other articles are shown in the catalogue.

With a record of half a century the Ashcroft company undoubtedly has full claim to the title "Original Steam Gauge" works. The heads of this concern are among the best known men of the machinery trade. Charles A. Moore is president and general manager of the company, H. S. Manning, treasurer, and M. Luscomb, secretary.

Among recent shipments of Case outward thrust propeller wheels, made by A. Wells Case & Son, Highland Park, Conn., may be mentioned six of large size to the Pacific coast; a 48-inch bronze wheel for a yacht building at the Detroit Boat Works; two 8½-foot wheels for the Hartford & New York Trans. Co. and also six bronze wheels for the Russ Motor Co. Two vessels of Nova Scotia, the Malcome Come and Gladiator have just been equipped with this type of wheel, the former one of 8 feet diameter and the latter 7 feet.

Mr. A. C. Ashton, secretary and treasurer of the Ashton Valve Co., Boston, sailed from New York for London via Southampton, on the steamer New York, March 28. The Ashton Valve Co. is well and favorably known to the trade as manufacturers of high grade pop safety valves and pressure and vacuum gauges. Mr. Ashton is to be gone about six weeks. He will visit Paris and install the company's exhibit at the exhibition.



STEAMER GARGANTUA—TO ENGAGE IN LAKE AND ATLANTIC SERVICE

TRADE NOTES.

Thos. P. Egan, president of J. A. Fay & Egan Co., large woodworking machinery manufacturers of Cincinnati, was recently nominated for presidential elector from the second congressional district of Ohio. Mr. Egan is in no sense a politician, and his selection is therefore a tribute to his high standing in the community and amongst the large manufacturers of the country. Mr. Egan goes to Paris in June to visit the exposition, where his firm is making a large exhibit, having been requested by the government to represent the United States there. He will return in time for the election.

The Lozier Motor Co. of Toledo, manufacturers of gas engines and naphtha launches, are in correspondence with the civil authorities of several towns in the neighborhood of New York city with a view to establishing a large plant for the manufacture of gas engines, launches and automobiles. The company is the outgrowth of the naphtha launch department of the firm of H. A. Lozier & Co. of Cleveland, and has now outgrown its present quarters at Toledo. It proposes to establish a plant at some seaport or river town near New York. Launches up to 35 feet are now built at the Toledo works, but when located in a new plant it is proposed to build anything in the boat line up to 100 feet or more.

Marine clocks for yachts, yacht clubs, vessels, etc., are made by the Chelsea Clock Co. of Boston, Mass., a concern that certainly has a reputation for high grade goods in this line. By the use of automatic machinery and by producing the goods in quantities they are enabled to supply dealers so they can be retailed at a low price in view of the quality. Among their specialties is the new ship's bell's clock, a very compact, attractive article of merit, which is protected by patents with other patents applied for. One excellent feature of this clock is that it is in a closed case, making it practically water, fog, dust and insect proof, and insuring longer life for the clock and greater freedom from repairs than is possible in the usual makes having openings in the case. This clock is of particular interest to owners of good yachts, yacht clubs, etc. This company's regular yacht clocks, non-magnetic clocks and improved ship's clocks are all excellent for their respective purposes. All have jewelled escapements, compensation balances and run at least eight days with one winding. Leading dealers in this class of goods in Boston, New York, Philadelphia, Baltimore and other places, carry these clocks, and to them prospective buyers should apply. The Chelsea Co. makes only high grade goods.

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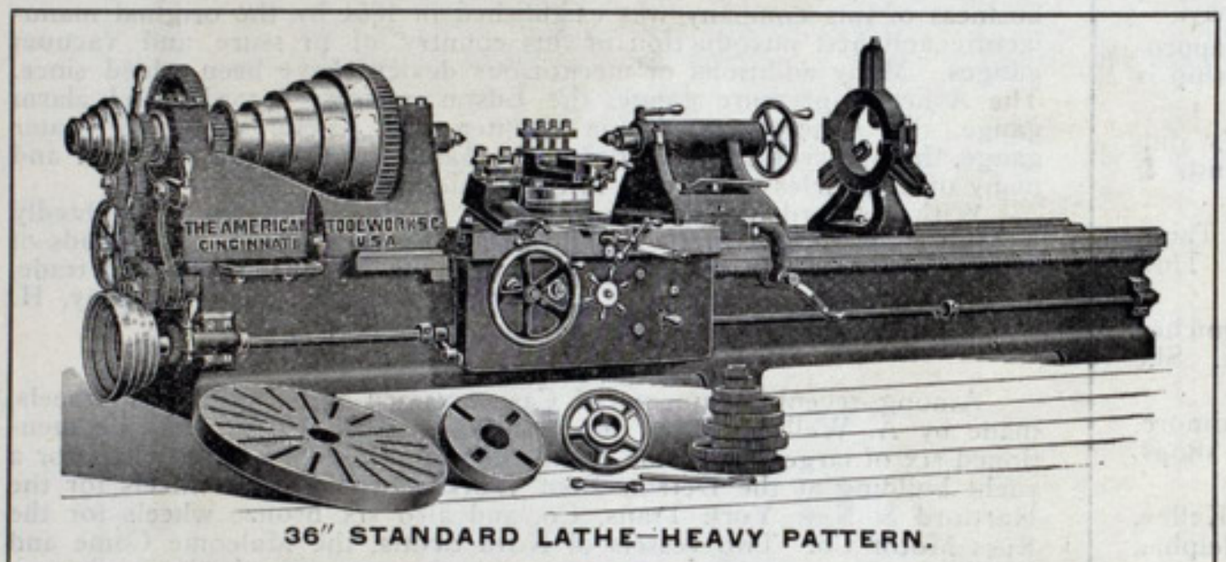
Tools for Economical Production.



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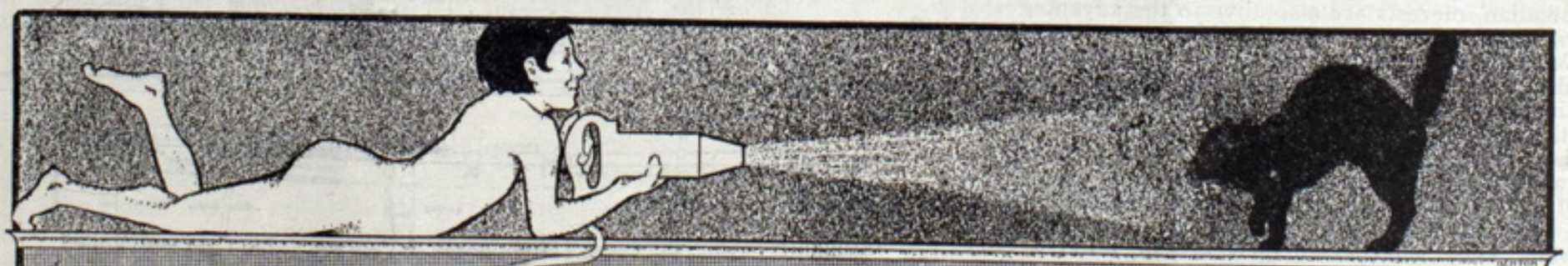
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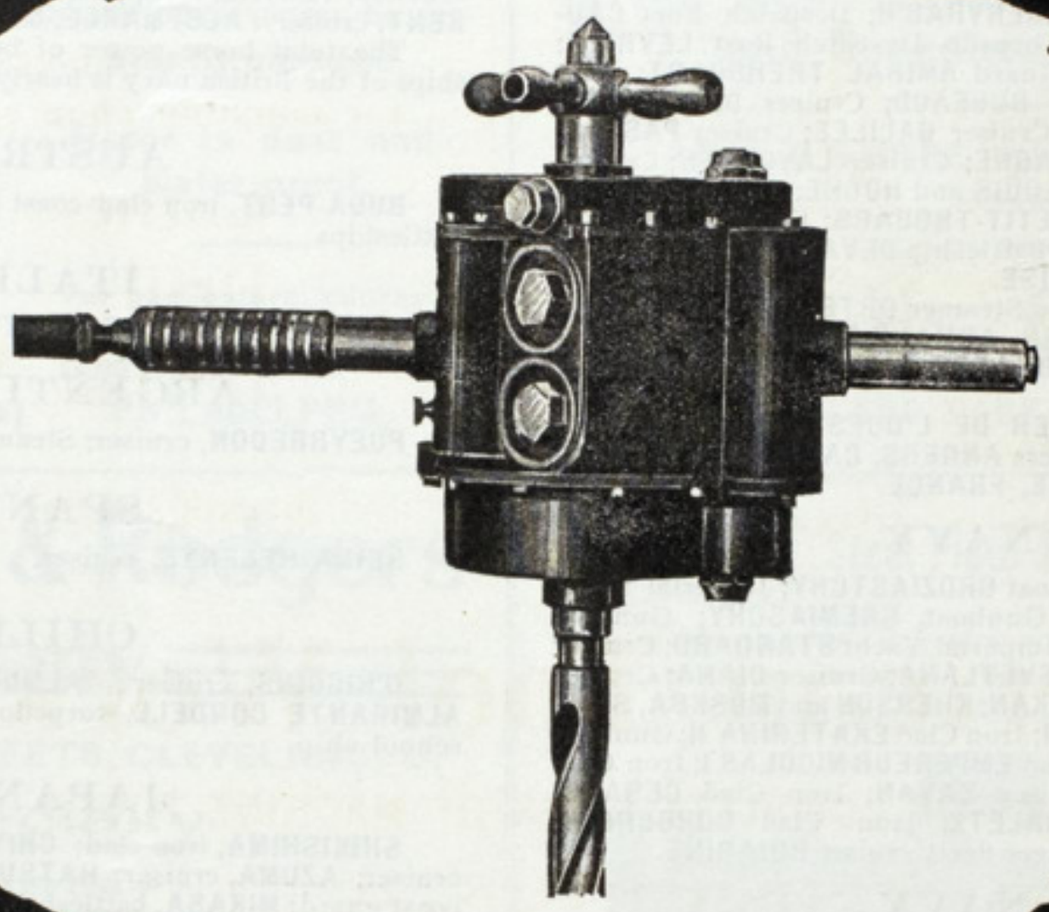
They consume fifty per cent less air and do far more work than rotary or any other type of air drills. If you want to verify this we will send a machine on trial, and pay express charges both ways.



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Sealed proposals will be received at the office of the Light-House Engineer, Detroit, Mich., until 12 o'clock M., May 18, 1900, and then opened, for furnishing the materials and labor of all kinds necessary for the complete construction of the wharf, oil house, buoy shed, custodian's dwelling, barn, boat-house, fences and walks, and to do all necessary grading, for the light-house and buoy depot on Sugar Island, St. Mary's River, Mich., in accordance with specifications, copies of which, with blank proposals and other information, may be had upon application to Thos. H. Handbury, Major, Corps of Engineers, U. S. A. May 10.

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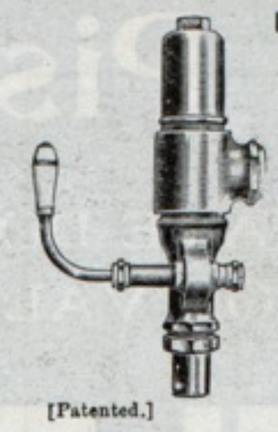

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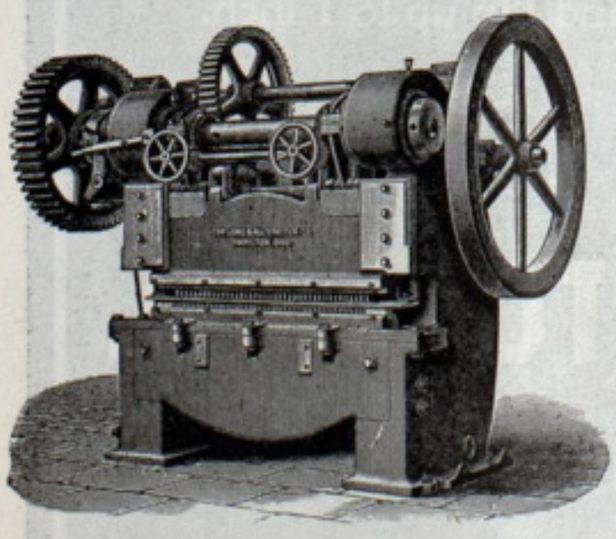

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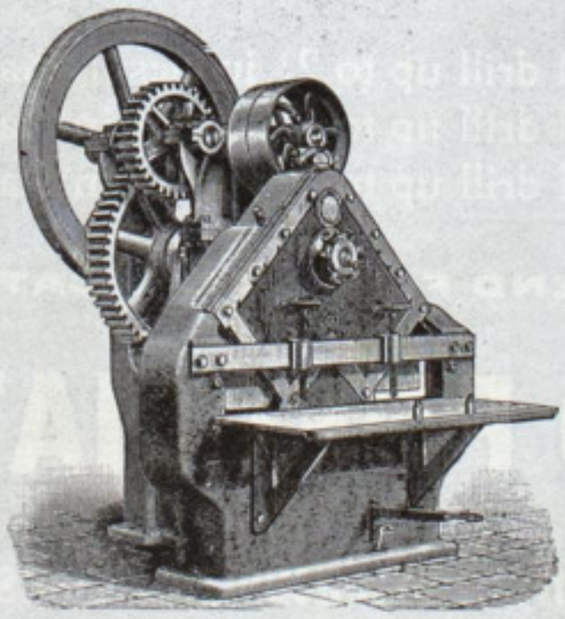

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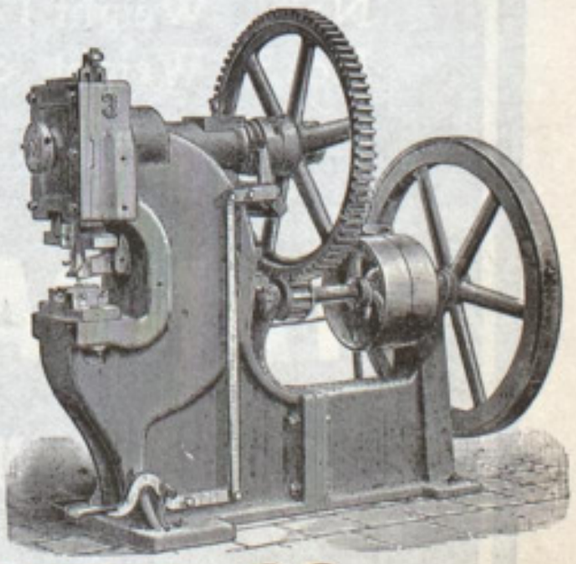

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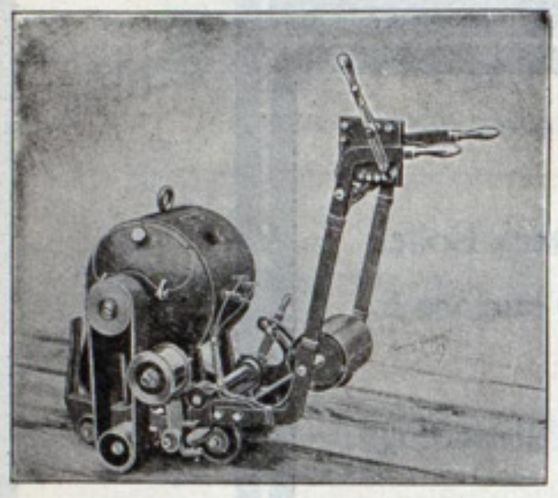

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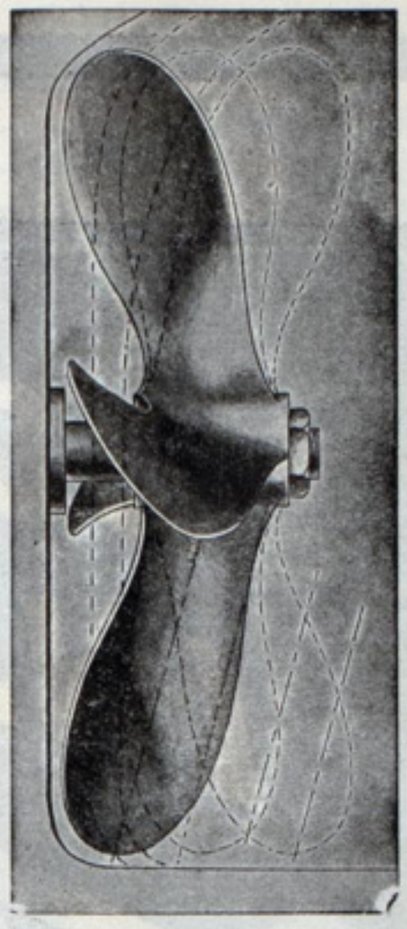

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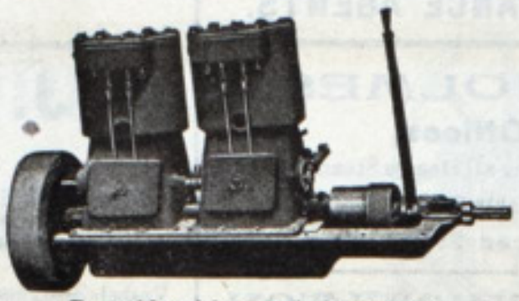

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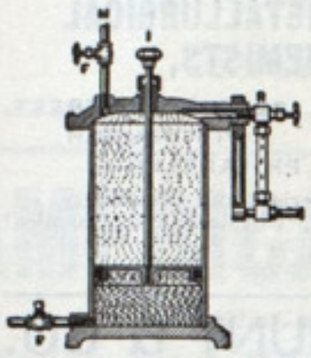

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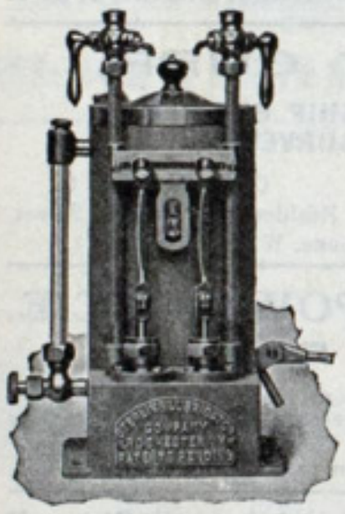

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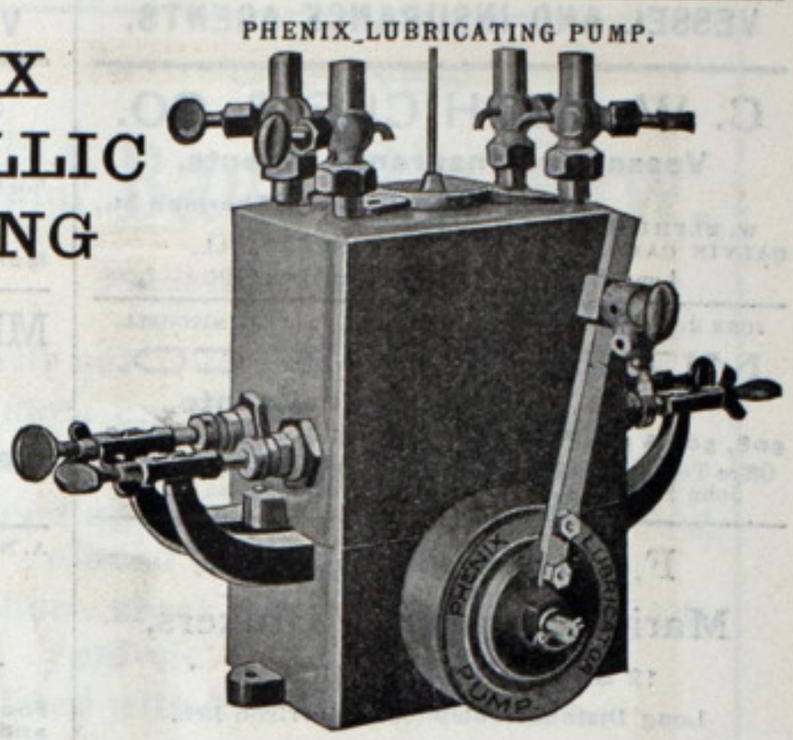

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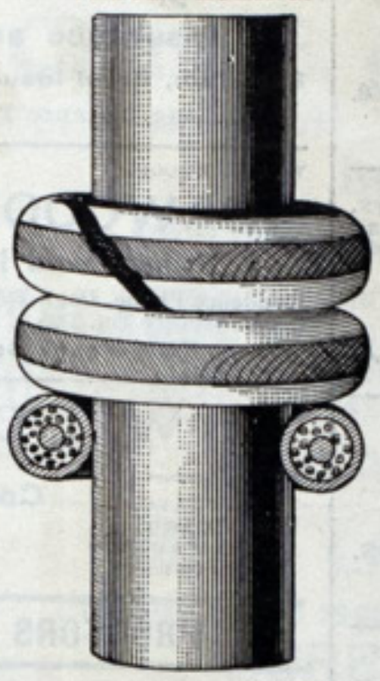

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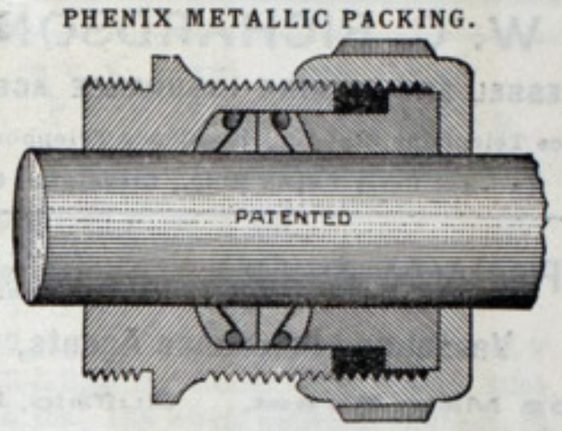

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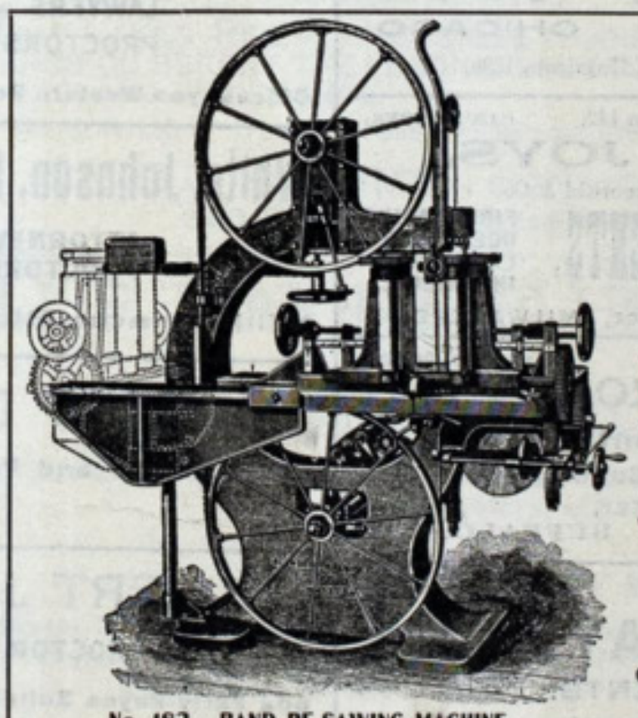

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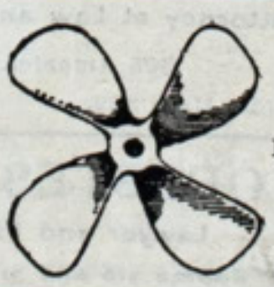

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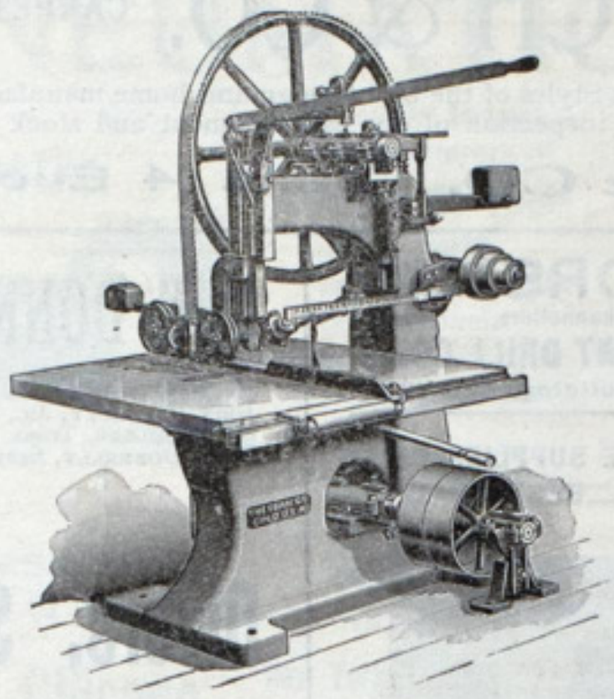

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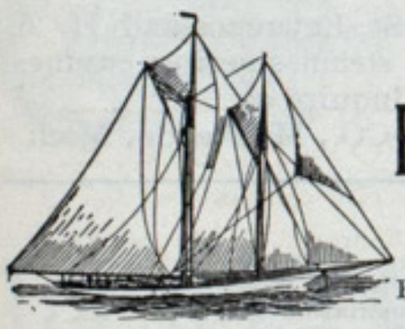

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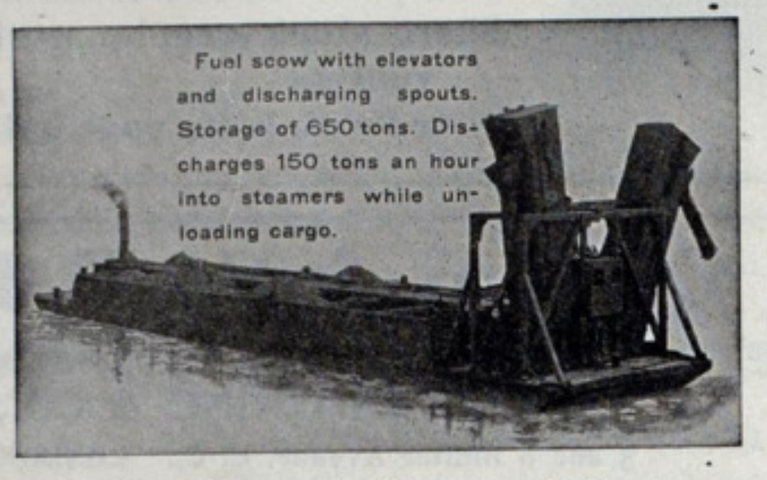

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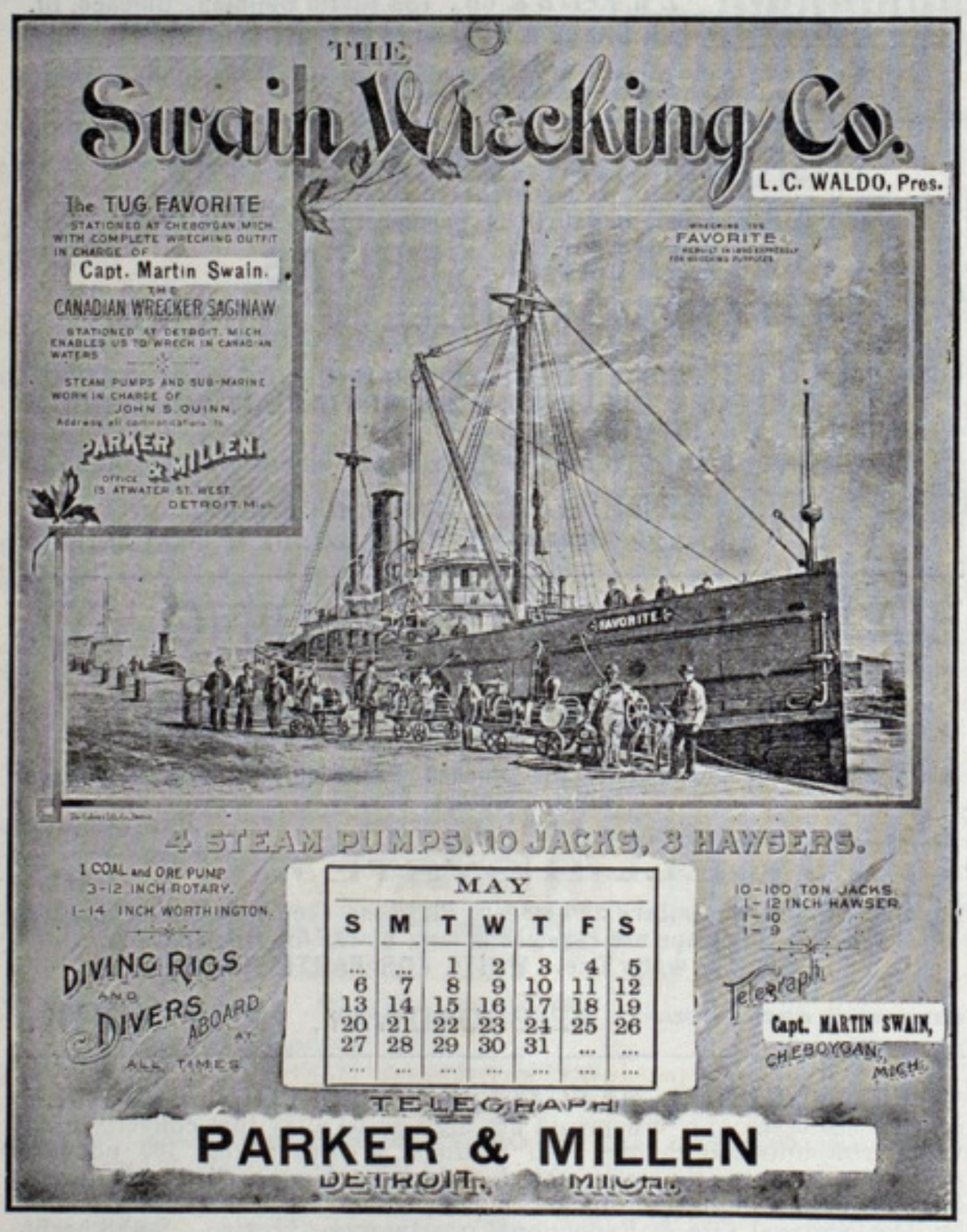

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Deep Water Harbor, San Pedro, Cal.—U. S. Engineer Office, Laughlin Building, Los Angeles, Cal., April 12, 1900. Sealed proposals for continuing construction of breakwater at San Pedro, Cal., will be received here until 11 A. M. May 14, 1900, and then publicly opened. Information furnished on application. James J. Meyler, Capt., Engrs. May 3.

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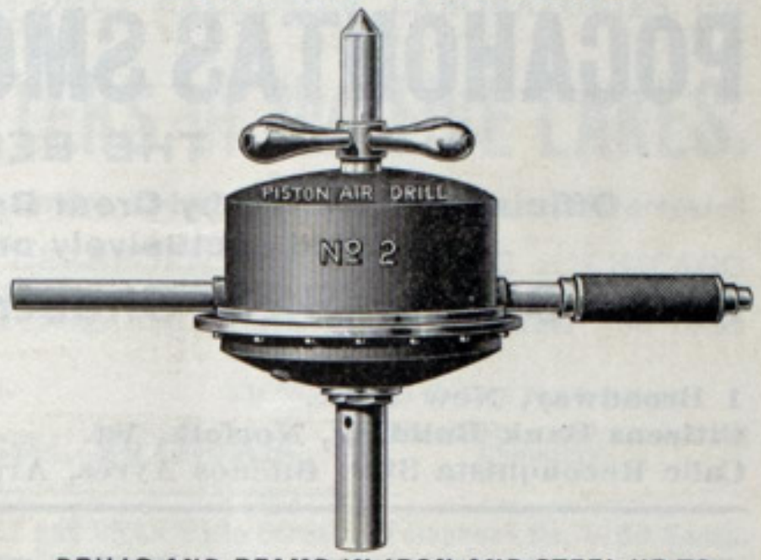

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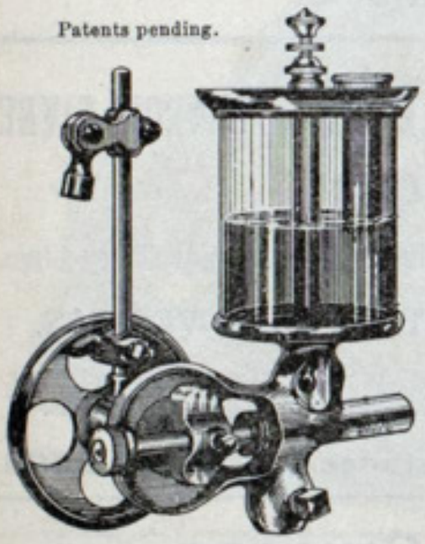

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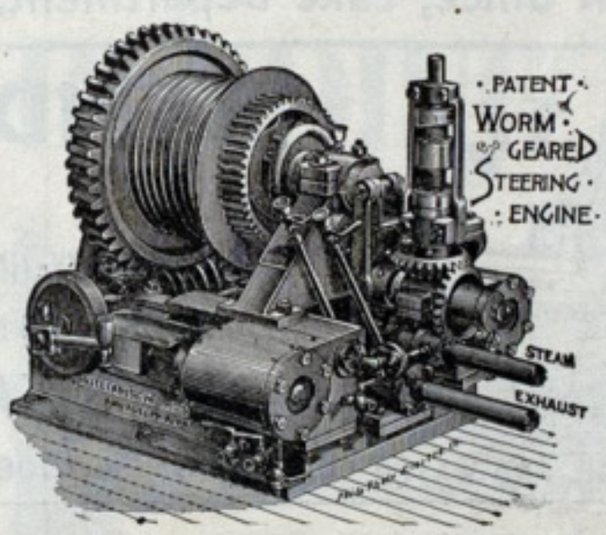

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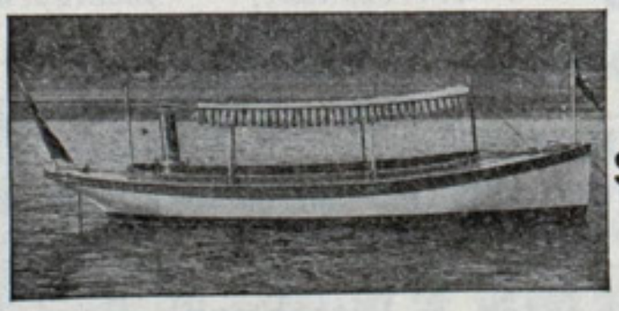

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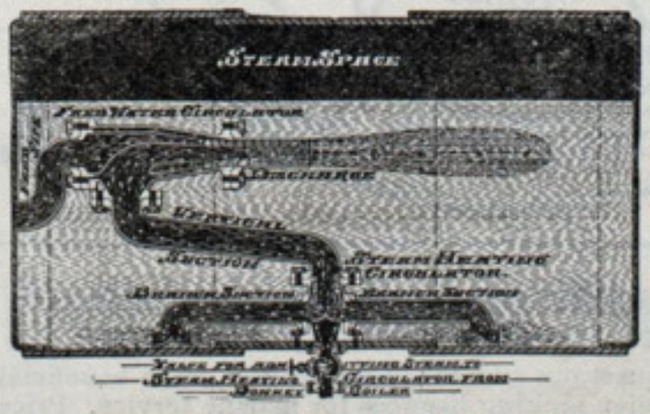

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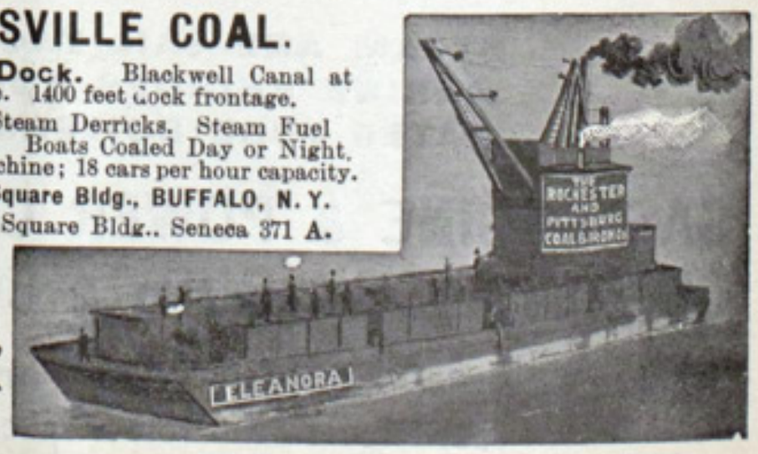
Capt. WM. H. HAZEN, Dock Superintendent.



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BY EMORY EDWARDS.

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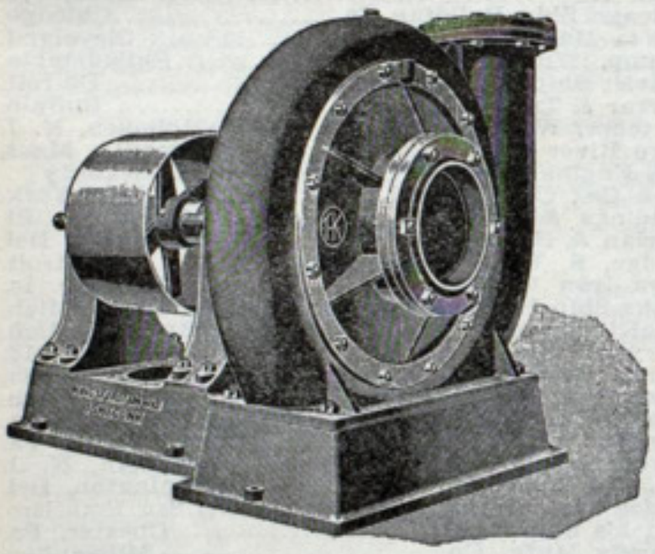

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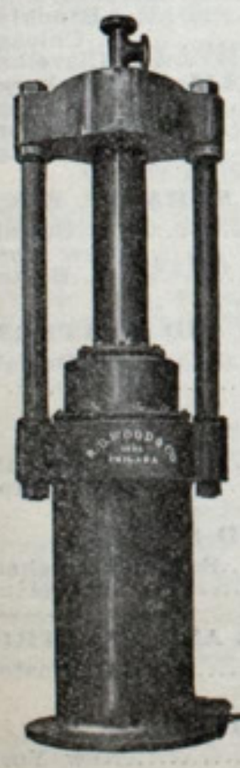

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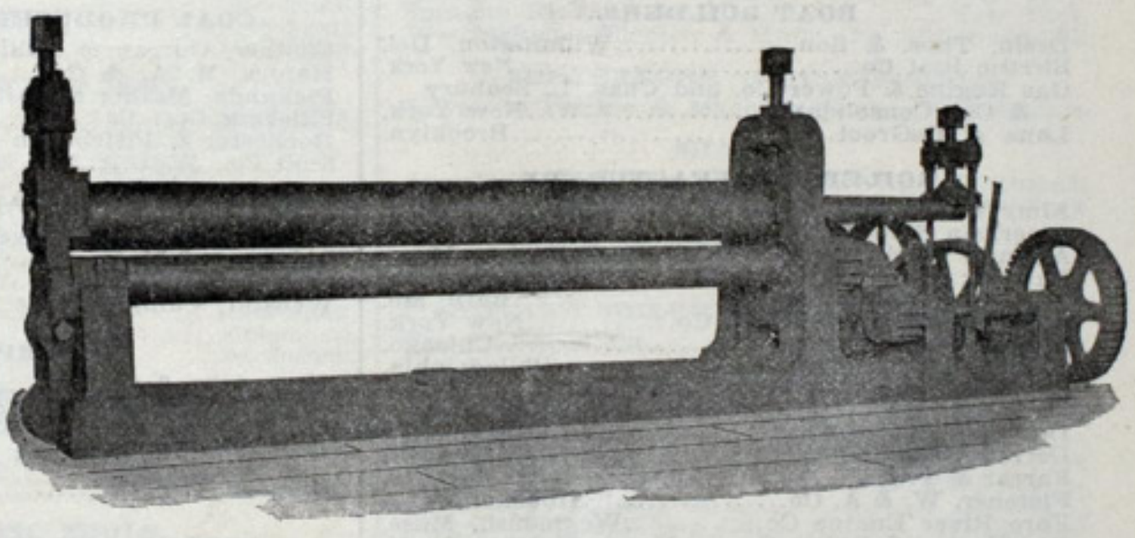

These rolls will bend plate to a complete circle. The outer bearing of upper roll is hinged, the roll being supported independently, so that plates bent to a complete circle are easily removed.

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Cleveland Punch & Shear Works Co.

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Mar. 15, 1900.

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For a more complete classification than that represented by advertisers in the Marine Review, see the BLUE BOOK OF AMERICAN SHIPPING, marine and naval directory of the United States, published by the Marine Review Pub. Co., 418-419 Perry-Payne Bldg., Cleveland.

See accompanying Index of Advertisers for full addresses of concerns in this directory.

AIR COMPRESSORS, AIR HOISTS, ETC.

Chicago Pneumatic Tool Co.....Chicago.
Ingersoll-Sergeant Drill Co.....New York.
Manning, Maxwell & Moore.....New York.
Philadelphia Pneumatic Tool Co.....Philadelphia.

ANCHORS.

Baldt Anchor Co.....Chester, Pa.
International Anchor Co.....Cleveland.

ANTI-FRICTION METALS.

Ajax Metal Co.....Philadelphia.
Cramp, Wm. & Sons.....Philadelphia.
Illinois Smelting & Refining Works.....Chicago.
Magnolia Metal Co.....New York.
Phosphor Bronze Smelting Co., Ltd....Philadelphia.

ARTIFICIAL DRAFT FOR BOILERS.

American Ship Building Co.....Cleveland.
Bloomsburg & Co., H.....Newport News, Va.
Buffalo Forge Co.....Buffalo.
Detroit Shipbuilding Co.....Detroit.
Sprague Electric Co.....New York.
Sturtevant, B. F. Co.....Boston.

ATTORNEYS AND PROCTORS IN ADMIRALTY.

Crowl, Samuel H.....Cleveland.
Gilchrist, Albert J.....Cleveland.
Goulder, Harvey D.....Cleveland.
Hoyt, Dustin & Kelley.....Cleveland.
Pinney, Orestes C.....Cleveland.
White, Johnson, McCaslin & Cannon.....Cleveland.

AXLES, SOLID AND HOLLOW.

Bethlehem Steel Co.....So. Bethlehem, Pa.

BABBITT METAL.

Ajax Metal Co.....Philadelphia.
Cramp, Wm. & Sons.....Philadelphia.
Illinois Smelting & Refining Works.....Chicago.
Magnolia Metal Co.....New York.
Phosphor Bronze Smelting Co., Ltd....Philadelphia.

BAROMETERS, MARINE GLASSES, ETC.

Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.

BENDING AND STRAIGHTENING ROLLS.

Cleveland Punch & Shear Works Co.....Cleveland.
Long & Allstatter Co.....Hamilton, O.
New Doty Mfg. Co.....Janesville, Wis.

BLOCKS, SHEAVES, ETC.

Boston & Lockport Block Co.....Boston, Mass.
Cleveland Block Co.....Cleveland.
Donohue & Co., John T.....Baltimore.

BLOWERS.

Buffalo Forge Co.....Buffalo.
Sprague Electric Co.....New York.
Sturtevant, B. F. Co.....Boston.

BOAT BUILDERS.

Drein, Thos. & Son.....Wilmington, Del.
Electric Boat Co.....New York.
Gas Engine & Power Co. and Chas. L. Seabury & Co., Consolidated.....New York.
Lane & DeGroot.....Brooklyn.

BOILER MANUFACTURERS.

Almy Water Tube Boiler Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Babcock & Wilcox Co.....New York.
Bath Iron Works, Ltd.....Bath, Me.
Boyer Water Tube Boiler Co.....New York.
Chicago Ship Building Co.....Chicago.
Cramp, Wm. & Sons.....Philadelphia.
.Dearing Water Tube Boiler Co.....Detroit.
Delaunay, Belleville & Co.....St. Denis, France.
Detroit Screw Works.....Detroit.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fletcher, W. & A. Co.....Hoboken, N. J.
Fore River Engine Co.....Weymouth, Mass.
Gas Engine & Power Co.....Morris Heights, N. Y.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Iowa Iron Works.....Dubuque, Ia.
Jenks Ship Building Co.....Port Huron, Mich.
Kingsford Found'y & Machine Works.Oswego, N. Y.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg. Co..Philadelphia.
Newport News Ship Bldg. Co...Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roberts Safety Water Tube Boiler Co....New York.
Stirling, The Co.....Chicago.
Trigg, Wm. R. Co.....Richmond, Va.
Union Iron Works.....San Francisco.
Wolff & Zwicker Iron Works.....Portland, Ore.

BOILER COMPOUNDS.

Dearborn Drug & Chemical Works.....Chicago.

BOILER COMPOUND FEEDER.

Hall Compound Feeder Co.....Chicago.

BOILER TUBES, SEAMLESS, WELDLESS—Steel, Brass and Copper.

Atlantic Tube Co.....Pittsburg.
Hungerford Brass & Copper Co.....New York.
Shelby Steel Tube Co.....Cleveland.

BOILER FURNACES, FIRE FRONTS, ETC.

Continental Iron Works.....New York.

BOILER RIVETS.

Bourne Fuller Co.....Cleveland.
Champion Rivet Co.....Cleveland.

BOILER STAYBOLT IRON.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

BOLT CUTTERS.

American Tool Works Co. (The).....Cincinnati.
Manning, Maxwell & Moore.....New York.

BORING AND TURNING MILLS.

American Tool Works Co. (The).....Cincinnati
Bement, Miles & Co.....Philadelphia.
Manning, Maxwell & Moore.....New York.

BRASS AND BRONZE CASTINGS, SHEETS, RODS, ETC.

Ajax Metal Co.....Philadelphia.
Cory, Chas. & Son.....New York.
Cramp, Wm. & Sons.....Philadelphia.
Illinois Smelting & Refining Works.....Chicago.
Magnolia Metal Co.....New York.

BRIDGES, BUILDERS OF.

Berlin Iron Bridge Co.....East Berlin, Conn.
Scherzer Rolling Lift Bridge Co.....Chicago.

BUCKETS, ORE AND COAL.

Brown Hoisting & Conveying Mach. Co..Cleveland.
McMyler Mnfg. Co.....Cleveland.
Webster, Camp & Lane Machine Co.....Akron, O.

CABIN AND CABINET FINISHING WOODS.

Martin-Barriss Co.....Cleveland.

CAPSTANS.

American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

CHAINS.

Lebanon Chain Works.....Lebanon, Pa.
Monongahela Iron & Steel Co. .....Pittsburg.

CHAIN HOISTS.

Boston & Lockport Block Co.....Boston, Mass.

CHUCKING MACHINES.

American Tool Works Co. (The).....Cincinnati.
Manning, Maxwell & Moore.....New York.

CIRCULATOR EQUILIBRIUM, with Steam Heating Attachment.

Bloomsburg & Co., H.....Newport News, Va.

CLOCKS (Marine), CHRONOMETERS, BELLS.

Ashton Valve Co.....Boston.
Bliss, John & Co.....New York.
Chelsea Clock Co.....Boston.
Ritchie, E. S. & Sons.....Brookline, Mass.

COAL PRODUCERS AND SHIPPERS.

Castner, Curran & Bullitt.....Philadelphia.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Rochester & Pittsburgh Coal & Iron Co....Buffalo.
Scott Co., W. L.....Erie, Pa.

COAL AND ORE HANDLING MACHINERY.

Brown Hoisting & Conveying Mach. Co..Cleveland.
Lidgerwood Mnfg. Co.....New York.
McMyler Mnfg. Co.....Cleveland.
Webster, Camp & Lane Machine Co.....Akron, O.

COMPASSES.

Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.

COMPASS ADJUSTER.

Simpson, Geo. A.....Sault Ste. Marie, Mich.

COPPER AND SHEET IRON WORK.

Pusey & Jones Co.....Wilmington, Del.

CORK JACKETS AND RINGS.

Armstrong Cork Co.....Pittsburgh, Pa.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

CRANES, CONVEYORS, HOISTS.

Brown Hoisting & Conveying Mach. Co..Cleveland.
Donohue & Co., John T.....Baltimore.
General Electric Co.....Schenectady, N. Y.
Lidgerwood Mnfg. Co.....New York.
Manning, Maxwell & Moore.....New York.
McMyler Mnfg. Co.....Cleveland.
Sprague Electric Co.....New York.
Webster, Camp & Lane Machine Co.....Akron, O.
Westinghouse Electric & Mnfg. Co. .....Pittsburg.

CRANK PINS.

Bethlehem Steel Co.....Bethlehem, So. Pa.

DECK PLANING MACHINERY.

Dallett, Thos. H. & Co.....Philadelphia.

DECK SEAMS, COMPOSITION FOR.

Cole & Kuhls.....Brooklyn, N. Y.

DRILLS—ROCK DRILLS, COAL CUTTERS, ETC.

Ingersoll-Sergeant Drill Co.....New York.

DRILL PRESSES—DRILLS OF ALL KINDS.

American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
Manning, Maxwell & Moore.....New York.

DRILLS, PNEUMATIC.

Chicago Pneumatic Tool Co.....Chicago.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Q. & C. Co.....Chicago.

DRYING APPARATUS.

Sturtevant Co., B. F.....Boston.

DRY DOCKS.

American Ship Building Co.....Cleveland.
Bath Iron Works, Ltd.....Bath, Me.
Chicago Ship Building Co.....Chicago.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Harlan & Hollingsworth Co.....Wilmington, Del.
McWilliams, Frank.....1 Broadway, New York.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Newport News Ship Bldg Co....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Townsend & Downey Ship Bldg. Co.....New York.
Union Dry Dock Co.....Buffalo.
Union Iron Works.....San Francisco.

ELEVATORS.

Morse, Williams & Co.....Philadelphia.

ELECTRIC LIGHT AND POWER PLANTS.

Buffalo Forge Co.....Buffalo.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Sprague Electric Co.....New York.
Sturtevant, B. F Co.....Boston.
Westinghouse Electric & Mnfg. Co..Pittsburgh, Pa.

ELECTRIC HOISTS AND CRANES.

Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Lidgerwood Mnfg. Co.....New York.
Manning, Maxwell & Moore.....New York.
Sprague Electric Co.....New York.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

ENGINE BUILDERS, MARINE.

American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Chicago Ship Building Co.....Chicago.
Chase Machine Co.....Cleveland.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fletcher, W. & A. Co.....Hoboken, N. J.
Fore River Engine Co.....Weymouth, Mass.
Gas Engine & Power Co., and Chas. L. Seabury & Co., Consolidated.....New York.
Giddings & Stevens.....Rockford, Ill.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Iowa Iron Works.....Dubuque, Ia.
Jenks Ship Building Co.....Port Huron, Mich.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg Co..Philadelphia.
Newport News Ship Bldg Co..Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.
Wolff & Zwicker Iron Works.....Portland, Ore.

ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.

Cory, Chas. & Son.....New York.

ENGINEERS, MARINE AND MECHANICAL.

Giddings & Stevens.....Rockford, Ill.
Hillman, Gustav.....Brooklyn.
Hunt, Robt. W. & Co.....Chicago.
Miller, Walter.....Cleveland.
Pittsburgh Testing Laboratory, Ltd.....Pittsburgh.
Powell, Ambrose V.....Chicago.
See, Horace.....New York.
Wood, W. J.....Chicago.

FANS FOR VENTILATION, EXHAUST, ETC.

Buffalo Forge Co.....Buffalo.
Sprague Electric Co.....New York.
Sturtevant, B. F. Co.....Boston.

FEED WATER PURIFIERS AND HEATERS.

Learmonth, Robert.....Buffalo.
Warren Webster & Co.....Camden, N. J.

FORGES.

Buffalo Forge Co.....Buffalo.
Sturtevant Co., B. F.....Boston.

FORGINGS, IRON AND STEEL.

Bethlehem Steel Co.....South Bethlehem.
Bourne-Fuller Co.....Cleveland.

FIXTURES FOR LAMPS, OIL AND ELECTRIC.

Page Bros. & Co.....Boston.

FLUSHOMETERS.

Kenney, The Co.....New York.

FURNACES FOR BOILERS.

Continental Iron Works.....New York.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

FUELING COMPANIES AND COAL DEALERS.

Castner, Curran & Bullitt (Pocahontas)..... Philadelphia.
Graham, James & Co.....Detroit.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Rochester & Pittsburgh Coal & Iron Co..Buffalo.
Smith, Stanley B. & Co.....Detroit.
Scott Co., W. L.....Erie, Pa.

GAS BUOYS.

Safety Car Heating & Lighting Co.....New York.

GAS AND GASOLINE ENGINES.

Chicago Water Motor & Fan Co.....Chicago.
Giddings & Stevens.....Rockford, Ill.
McMyler Mnfg. Co.....Cleveland.
Olds Motor Works.....Detroit.

GAGES, STEAM AND VACUUM.

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.
Manning, Maxwell & Moore.....New York.

GRAPHITE.

Dixon Crucible Co., Joseph.....Jersey City, N. J.

HAMMERS, PNEUMATIC.

Chicago Pneumatic Tool Co.....Chicago.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Q. & C. Co.....Chicago.
Standard Pneumatic Tool Co.....Chicago.

HAMMERS, POWER DROP.

Bement, Miles & Co.....Philadelphia.
Chase Machine Co.....Cleveland.

HEATING APPARATUS.

Sturtevant Co., B. F.....Boston.

HOISTS FOR CARGO, ETC.

American Ship Building Co.....Cleveland.
Brown Hoisting & Conveying Mach. Co..Cleveland.
Chase Machine Co.....Cleveland.
Donohue & Co., John T.....Baltimore.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....New York.
Hodge, S. F. & Co.....Detroit.
Hyde Windlass Co.....Bath, Me.
Lidgerwood Mnfg. Co.....New York.
Manning, Maxwell & Moore.....New York.
McMyler Mnfg. Co.....Cleveland.
Marine Iron Co.....Bay City.
Sprague Electric Co.....New York.
Williamson Bros.....Philadelphia.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

INDICATORS FOR STEAM ENGINES.

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Ashcroft Mnfg. Co.....New York.
Crosby Steam Gage & Valve Co.....Boston.

INJECTORS.

Jenkins Bros.....New York.
Hayden & Derby Mnfg. Co.....New York.
Penberthy Injector Co.....Detroit.

INSURANCE, MARINE.

Brown & Co.....Buffalo.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Gibbs & Joys.....Milwaukee.
Hawgood & Moore.....Cleveland.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
La Salle & Co.....Duluth.
Mitchell & Co.....Cleveland.
Myers, James A.....Chicago.
Osborn & Co., F. H.....Chicago.
Pauly, H. J.....Milwaukee.
Parker & Millen.....Detroit.
Peck, Chas. E. & W. F.....New York and Chicago.
Richardson, W. C.....Cleveland.

IRON ORE AND PIG IRON.

Bourne-Fuller Co.....Cleveland.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.

LATHES OF ALL KINDS.

American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
Manning, Maxwell & Moore.....New York.

LAUNCHES—NAPHTHA, ELECTRIC.

Electric Boat Co.....New York.
Gas Engine & Power Co.....New York.

LIFE BOATS—METALLIC.

Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.

LIFE PRESERVERS, LIFE BOATS, BUOYS, RAFTS, ETC.

Armstrong Cork Co.....Pittsburg.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

LIGHTS, SIDE AND SIGNAL.

Page Bros. & Co.....Boston.

LUBRICATING PUMPS.

Manzel Bros.....Buffalo.
Phenix Metallic Packing Co.....Chicago.
Sterling Lubricator Co.....Rochester, N. Y.

MACHINE TOOLS.

American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
Manning, Maxwell & Moore.....New York.

MACHINE TOOLS (WOOD WORKING).

Egan Co., The.....Cincinnati.
Fay, J. A. & Co.....Cincinnati.
Woods Machine Co., S. A.....So. Boston.

MATTRESSES, CUSHIONS, BEDDING.

Fogg, M. W.....New York.
Mechanical Fabric Co.....Providence, R. I.

METALLIC PACKING.

Katzenstein, L. & Co.....New York.
Phenix Metallic Packing Co.....Chicago.
U. S. Metallic Packing Co.....Philadelphia.

METALS FOR BEARINGS.

Ajax Metal Co.....Philadelphia.
Cramp, Wm. & Sons.....Philadelphia.
Illinois Smelting & Refining Works.....Chicago.
Magnolia Metal Co.....New York.
Phosphor Bronze Smelting Co., Ltd...Philadelphia.

METAL POLISH.

Bertram's Oil Polish Co.....Boston, Mass.

MILLING MACHINES OF ALL KINDS.

American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
Manning, Maxwell & Moore.....New York.

NAUTICAL INSTRUMENTS.

Bliss, John & Co.....New York.
Ritchie & Sons, E. S.....Brookline, Mass.

NAVAL ARCHITECTS.

Curr, Robert.....Cleveland.
Hillman, Gustav.....Brooklyn.
See, Horace.....New York.
Wood, W. J.....Chicago.

NICKEL STEEL FORGINGS.

Bethlehem Steel Co.....So. Bethlehem, Pa.

OILS AND LUBRICANTS.

Dixon Crucible Co., Jos.....Jersey City, N. J.
Standard Oil Co.....Cleveland.

PACKING.

Jenkins Bros.....New York.
Katzenstein, L. & Co.....New York.
Phenix Metallic Packing Co.....Chicago.
U. S. Metallic Packing Co.....Philadelphia.

PAINTS.

Baker, Howard H. & Co.....Buffalo.
Smith, Edward & Co.....New York.
Upson-Walton Co.....Cleveland.

PAINTING MACHINES, PNEUMATIC.

Chicago Pneumatic Tool Co.....Chicago.

PATENT ATTORNEYS.

Thurston & Bates.....Cleveland.

PATTERN SHOP MACHINERY.

Egan Co., The.....Cincinnati.
Fay, J. A. & Co.....Cincinnati.
Woods Machine Co., S. A.....So. Boston.

PIPE, WROUGHT IRON.

Bourne-Fuller Co.....Cleveland.

PLANERS OF ALL KINDS.

American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
Manning, Maxwell & Moore.....New York.

PLANING MILL MACHINERY.

Egan Co., The.....Cincinnati.
Fay, J. A. & Co.....Cincinnati.
Woods Machine Co., S. A.....So. Boston.

PLUMBING, MARINE.

Ellis Marine Plumbing Co.....New York.
Mott Iron Works, J. L.....New York.
Sands, Alfred B. & Son.....New York.
Kenney, The Co.....New York.

PNEUMATIC TOOLS.

Chicago Pneumatic Tool Co.....Chicago.
Manning, Maxwell & Moore.....New York.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Q. & C. Co.....Chicago.
Standard Pneumatic Tool Co.....Chicago.

POLISH FOR METALS.

Bertram's Oil Polish Co.....Boston, Mass.

PROPELLER WHEELS.

American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works Ltd.....Bath, Me.
Case, A. Wells & Son.....Highland Park, Conn.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fore River Engine Co.....Weymouth, Mass
Hyde Windlass Co.....Bath Me.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
MacKinnon Mfg Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg Co...Philadelphia.
Newport News Ship Bldg. Co..Newport News. Va.
Nixon, Lewis.....Elizabeth, N. J.
Phosphor Bronze Smelting Co., Ltd...Philadelphia.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.
Wolff & Zwicker Iron Works.....Portland, Ore.

PROJECTORS, ELECTRIC.

Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Sprague Electric Co.....New York.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

PUMPS FOR VARIOUS PURPOSES.

Blake, Geo. F. Mnfg. Co.....New York.
Davidson, M. T.....Brooklyn, N. Y.
Donohue & Co., John T.....Baltimore.
Kingsford Foundry & Machine Works.....Oswego, N. Y.
Van Duzen, The E. W. Co.....Cincinnati.
Worthington, Henry R.....New York.

PUNCHES, RIVETERS, SHEARS.

American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
Long & Allstatter Co.....Cincinnati.
Manning, Maxwell & Moore.....New York.
New Doty Mnfg. Co.....Janesville, Wis.
Wood & Co., R. D.....Philadelphia.

RANGES, KITCHEN OUTFITS.

Born Steel Range & Mnfg. Co.....Cleveland.

REGISTER FOR CLASSIFICATION OF VESSELS.

Great Lakes Register.....Chicago.

RELEASING HOOKS FOR DETACHING BOATS.

Standard Aut. Releasing Hook Co.....New York.

RIVETS, STEEL, FOR SHIPS AND BOILERS.

Bourne-Fuller Co.....Cleveland.
Champion Rivet Co.....Cleveland.

RUBBER INSULATED WIRES.

Roebling's Sons, John A..New York and Cleveland.

SAFETY VALVES.

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Consolidated Safety Valve Co.....New York.
Crosby Steam Gage & Valve Co.....Boston.

SAIL MAKERS.

Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co.....Cleveland.
Wilson & Silsby.....Boston.

SALVAGE COMPANIES.

See wrecking companies.

SCREW MACHINES.

American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
Manning, Maxwell & Moore.....New York.

SEARCH LIGHTS.

Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Sprague Electric Co.....New York.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

SEPARATORS, (CENTRIFUGAL).

Keystone Engine & Machine Works..Philadelphia.

SHAPERS.

American Tool Works Co. (The).....Cincinnati.
Manning, Maxwell & Moore.....New York.

SHEARS.

See punches, riveters and shears.

SHIP AND BOILER PLATES AND SHAPES.

Bourne-Fuller Co.....Cleveland.

SHIP BUILDERS.

American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Detroit Shipbuilding Co.....Detroit.
Fore River Engine Co.....Weymouth, Mass.
Harlan & Hollingsworth Co.....Wilmington, Del.
Iowa Iron Works.....Dubuque, Ia.
Jenks Ship Building Co.....Port Huron, Mich.
McWilliams, Frank.....1 Broadway, New York.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg. Co..Philadelphia.
Newport News Ship Bldg. Co...Newport News. Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Townsend & Downey Ship Bldg. Co.....New York.
Trigg, Wm. R. Co.....Richmond, Va.
Union Dry Dock Co.....Buffalo.
Union Iron Works.....San Francisco.
Wolff & Zwicker Iron Works.....Portland, Ore.

SHIP CHANDLERS.

Baker, Howard H. & Co.....Buffalo.
Moran, Bros. Co.....Seattle, Wash.
Upson-Walton Co.....Cleveland.

SLING FRAME FOR HANDLING BARRELS.

Patriarche, H. R.....Milwaukee.

SPARS—LARGE SIZES.

Moran Bros. Co.....Seattle, Wash.

STAYBOLT IRON, HOLLOW AND SOLID.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

STEAM VESSEL FOR SALE.

Holmes, Samuel.....New York.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

STEAMSHIP LINES, PASS. AND FREIGHT.
American Line.....New York.
International Nav. Co.....Philadelphia.
Red Star Line.....New York.

STEEL SHAFTS, SOLID OR HOLLOW.
Bethlehem Steel Co.....So. Bethlehem, Pa.

STEERING APPARATUS.
American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Detroit Shipbuilding Co.....Detroit.
Donohue & Co., John T.....Baltimore.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Queen City Engineering Co.....Buffalo.
Sheriffs Mfg. Co.....Milwaukee.
Williamson Bros.....Philadelphia.

STOKERS FOR MARINE SERVICE.
American Stoker Co.....New York.

STOCKS, BONDS, SECURITIES.
Wright, Herbert & Co.....Cleveland.

STOCKLESS ANCHORS.
Baldt Anchor Co.....Chester, Pa.
International Anchor Co.....Cleveland.

STRUCTURES OF STEEL, BUILDERS OF.
Berlin Iron Bridge Co.....East Berlin, Conn.

SURVEYORS, MARINE.
Curr, Robert.....Cleveland.
Gibbs & Joys.....Milwaukee.

TELEGRAPH—DECK AND ENGINE ROOM.
Cory, Chas. & Son.....New York.

TESTS OF MATERIAL.
Hunt, Robert W. & Co.....Chicago.
Pittsburgh Testing Laboratory, Ltd.....Pittsburgh.

THRUST COLLARS FOR PROPELLER SHAFTS.
Ball Bearing Co.....Boston, Mass.

TIMBER—LARGE PIECES.
Moran Bros. Co.....Seattle, Wash.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.
American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
Chicago Pneumatic Tool Co.....Chicago.
Cleveland Punch & Shear Works Co. ...Cleveland.
Long & Allstatter, The Co.....Hamilton, O.
Manning, Maxwell & Moore.....New York.
New Doty Mnfg. Co.....Janesville, Wis.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Q. & C. Co.....Chicago.
Standard Pneumatic Tool Co.....Chicago.
Wood & Co., R. D.....Philadelphia.

TOOLS, WOOD WORKING.
Egan Co., The.....Cincinnati.
Fay, J. A. & Co.....Cincinnati.
Woods Machine Co., S. A.....So. Boston.

TRUCKS.
Boston & Lockport Block Co.....Boston, Mass.

TOWING MACHINES.
American Ship Windlass Co.....Providence, R. I.
Chase Machine Co.....Cleveland.

TOWING COMPANIES.
Calvin Co., The.....Kingston, Ont.
Donnelly Salvage & Wrecking Co...Kingston, Ont.
Swain Wrecking Co.....Detroit.

TUBING, STEEL, COPPER AND BRASS.
Atlantic Tube Co.....Pittsburg.
Hungerford Brass & Copper Co., U. T...New York.
Merchant & Co., Inc.....Philadelphia.
Shelby Steel Tube Co.....Cleveland.

VALVES, STEAM SPECIALTIES, ETC.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.
Jenkins Bros.....New York.
Manning, Maxwell & Moore.....New York.

VARNISH MAKERS, COLOR GRINDERS, ETC.
Smith, Edward & Co.....New York.

VARNISH PAINT.
Mair, John & Son.....Philadelphia.

VESSEL AND FREIGHT AGENTS.
Boland, John J.....Buffalo.
Brown & Co.....Buffalo.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Gibbs & Joys.....Milwaukee.
Hall & Root.....Buffalo.
Hawgood & Moore.....Cleveland.
Holmes, Samuel.....New York.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
Miller, Bull & Knowlton.....New York.
Mitchell & Co.....Cleveland.
Moffat & O'Brien.....San Francisco.
Myers, James A.....Chicago.
Pauly, H. J.....Milwaukee.
Richardson, W. C.....Cleveland.

VENTILATING APPARATUS FOR SHIPS.
Buffalo Forge Co.....Buffalo.
Sprague Electric Co.....New York.
Sturtevant Co., B. F.....Boston.

WIRE ROPE.
American Steel & Wire Co.....Chicago.
Baker, H. H. & Co.....Buffalo.
Roebling's Sons, John A..New York and Cleveland.
Upson-Walton Co.....Cleveland.

WHISTLES, STEAM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

WINDLASSES.
American Ship Windlass Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.

WINCHES.
American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

WOOD WORKING MACHINERY.
Egan Co., The.....Cincinnati.
Fay, J. A. & Co.....Cincinnati.
Woods Machine Co., S. A.....So. Boston.

WORM GEARING.
Morse, Williams & Co.....Philadelphia.

WRECKING AND SALVAGE COMPANIES.
Calvin Co., The.....Kingston, Ont.
Donnelly Salvage & Wrecking Co...Kingston, Ont.
Playfair's Barge & Tug Line.....Midland, Ont.
Swain Wrecking Co.....Detroit.

YACHT SAILS, FITTINGS, HARDWARE, ETC.
Wilson & Silsby.....Boston.

YACHT AND BOAT BUILDERS.
Drein, Thos. & Son.....Wilmington, Del.
Electric Boat Co.....New York.
Gas Engine & Power Co.....New York.
Lane & DeGroot.....Brooklyn.

YACHT, MARINE AND SHIPS' BELL CLOCKS.
Ashton Valve Co.....Boston.
Bliss, John & Co.....New York.
Chelsea Clock Co.....Boston.
Ritchie, E. S. & Sons.....Brookline, Mass.

YAWLS.
Drein, Thos. & Son.....Wilmington, Del.
Lane & DeGroot.....Brooklyn.

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Wright, Herbert & Co. 26

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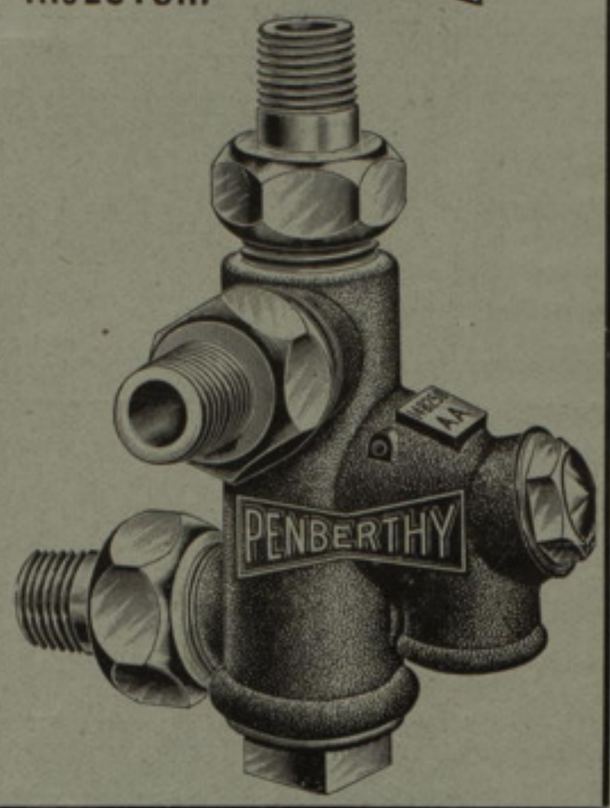

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No. 22,	Lake Shore Limited.....	*2 15 am	*2 20 am
No. 28,	New York & Boston Exp..	*7 40 am	*8 00 am
No. 32,	Fast Mail	*11 20 am	*11 25 am
No. 44,	Accom. via Sandusky.....	†1 15 pm	.....
No. 46,	Southwestern Express	.....	*3 00 pm
No. 6,	Limited Fast Mail.....	*5 40 pm	*5 45 pm
No. 10,	C., N. Y. & Boston Special	*7 35 pm	*7 40 pm
No. 2	Day Express	†9 10 pm	†9 35 pm
No. 126,	Norwalk Accommodation..	†7 55 am	.....
No. 40,	Tol. & Buff. Ac., v. Norw'k	†10 00 am	†10 30 am
No. 116,	Conneaut Accommodation.	.....	†4 30 pm

		Arrive from East.	Depart West
	Westward:—		
No. 11,	Southwestern Limited.....	*3 20 am	.....
No. 15,	N. Y., Bos. & Chi. Spl.....	*3 55 am	*4 05 am
No. 7,	Day Express	.....	†6 30 am
No. 19,	The Lake Shore Ltd.....	*7 45 am	*7 50 am
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No. 47,	Accommodation	.....	†3 00 pm
No. 141,	Sandusky Accommodation.	.....	†3 10 pm
No. 127,	Norwalk Accommodation..	.....	†5 10 pm
No. 37,	Pacific Express	*6 35 pm	*7 00 pm
No. 3,	Fast Mail Limited.....	*10 50 pm	*10 55 pm

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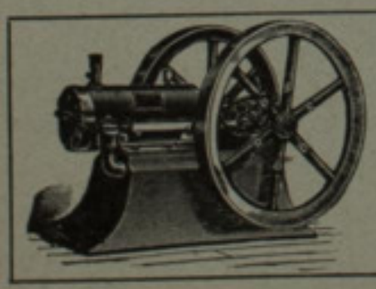

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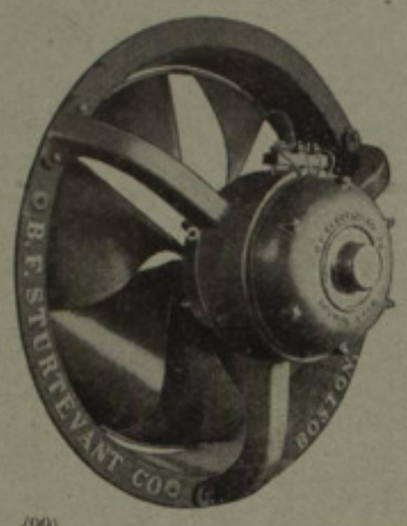

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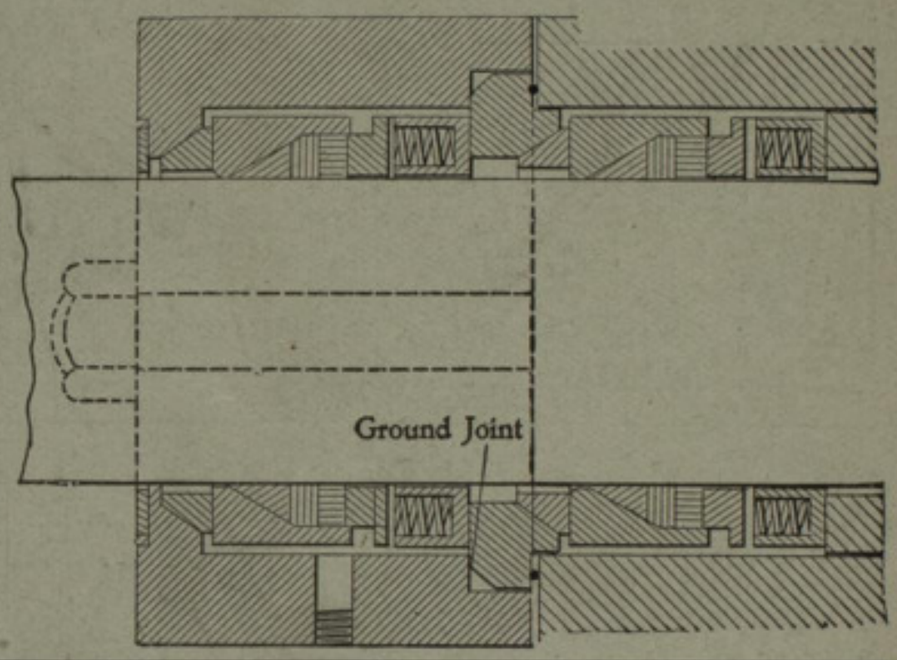

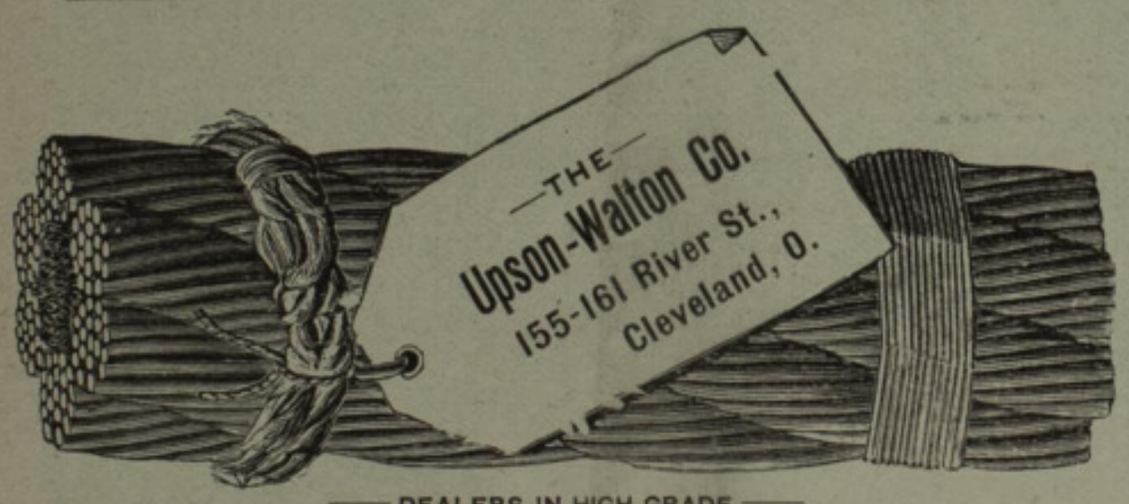

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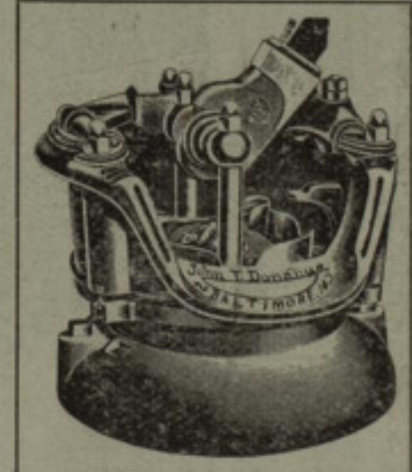

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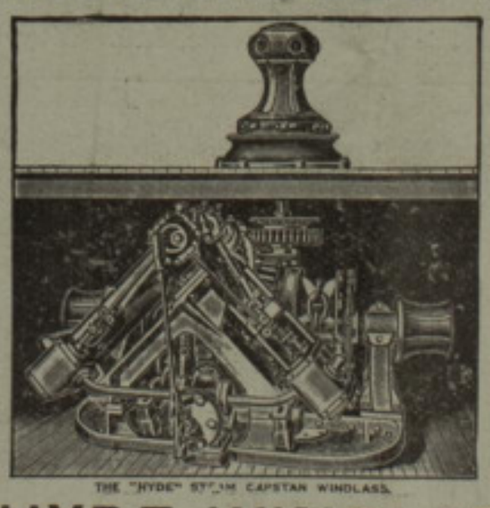
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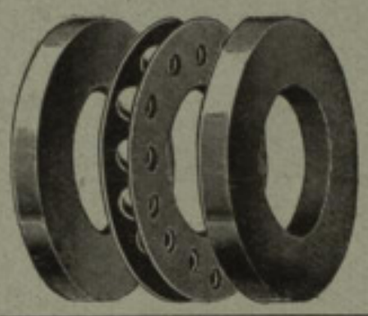

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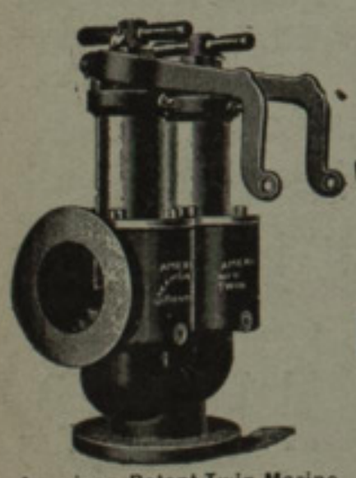

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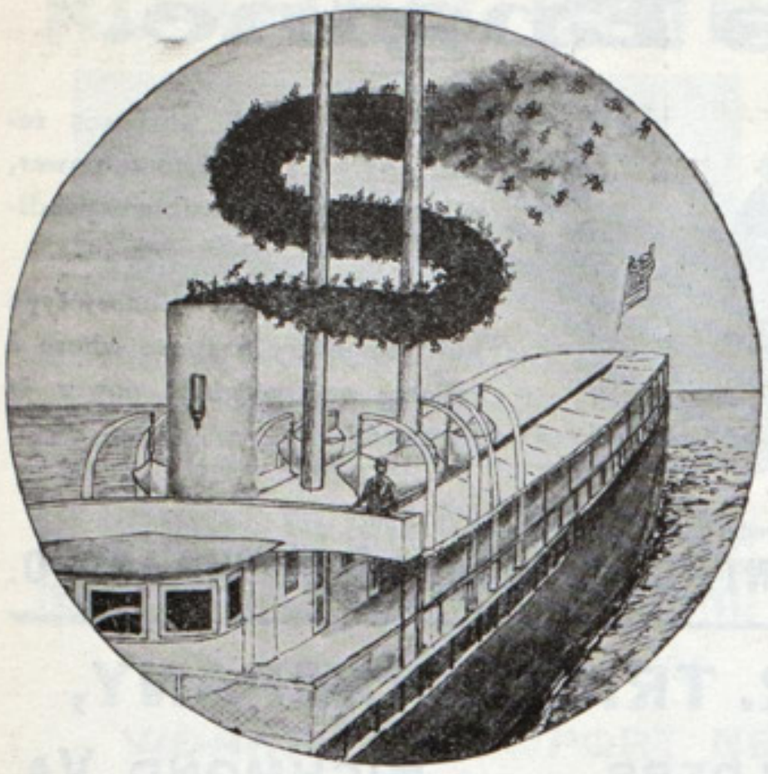

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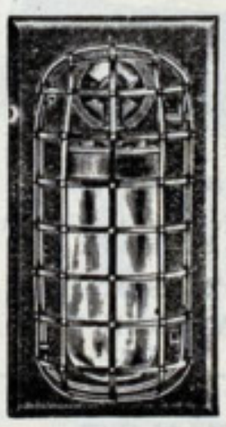

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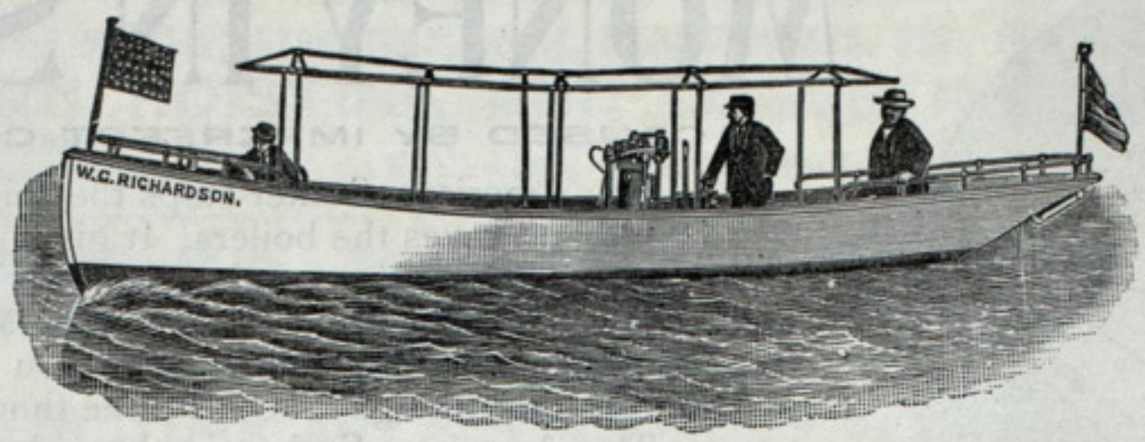

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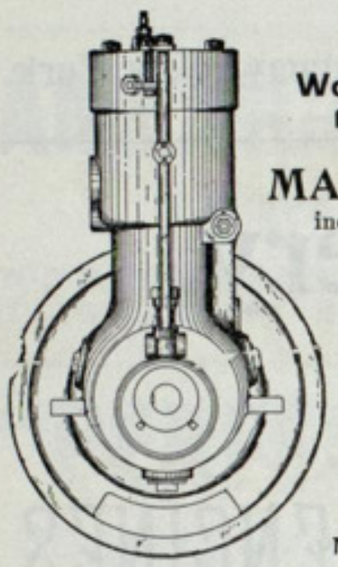

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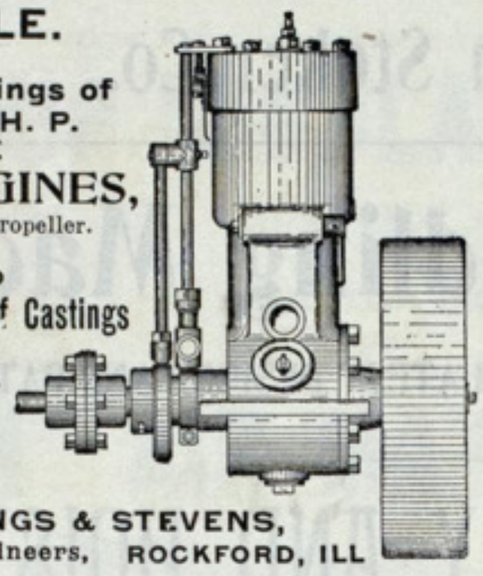

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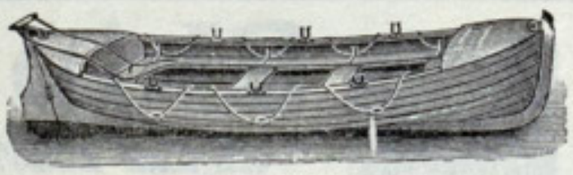

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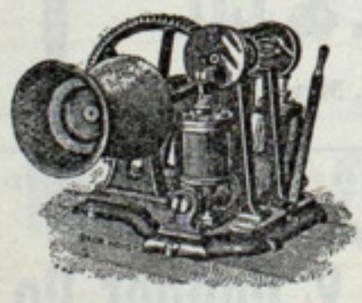

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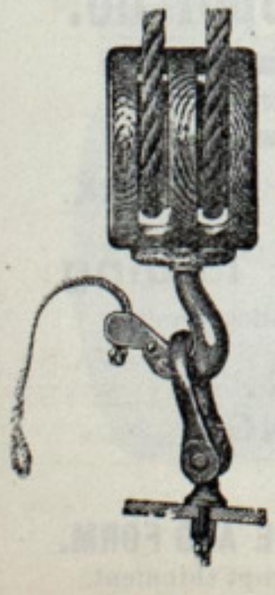

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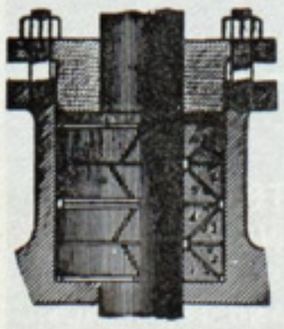

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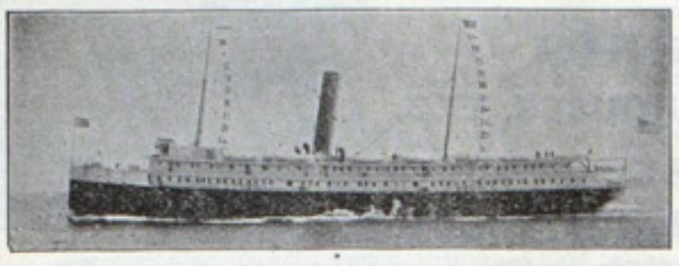

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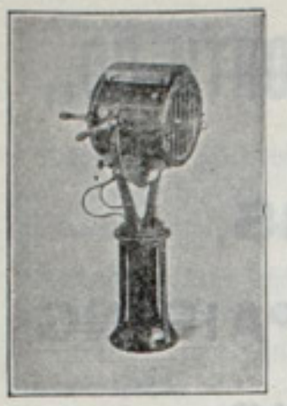

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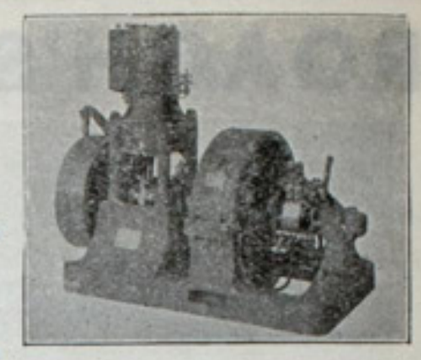

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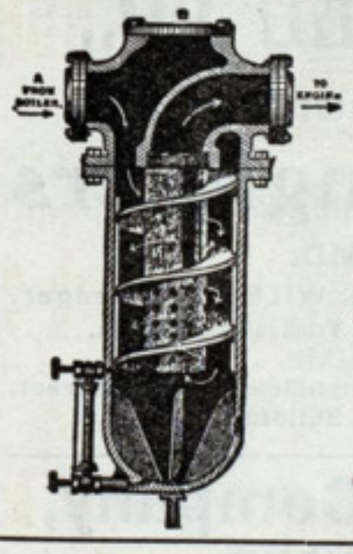

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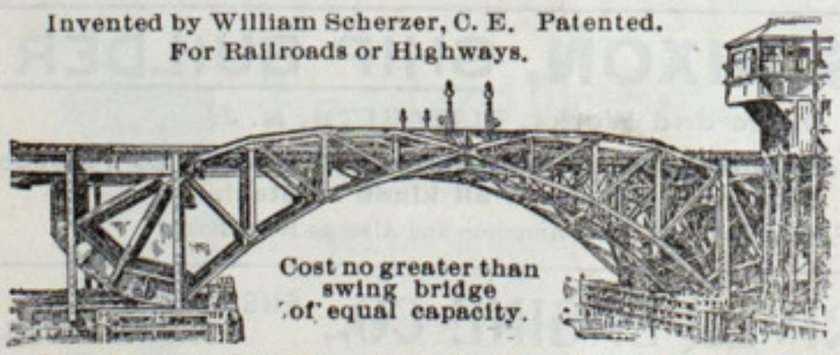

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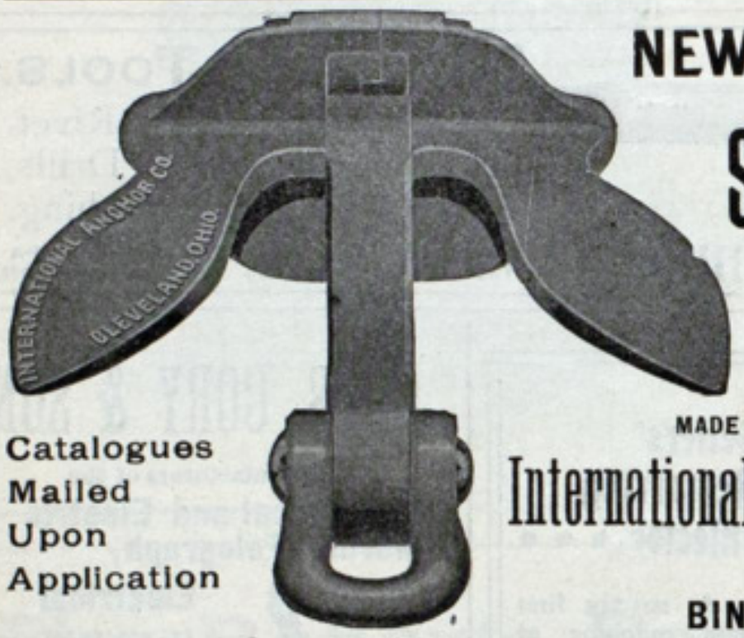

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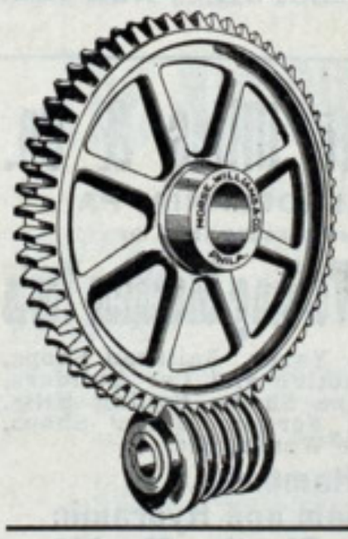

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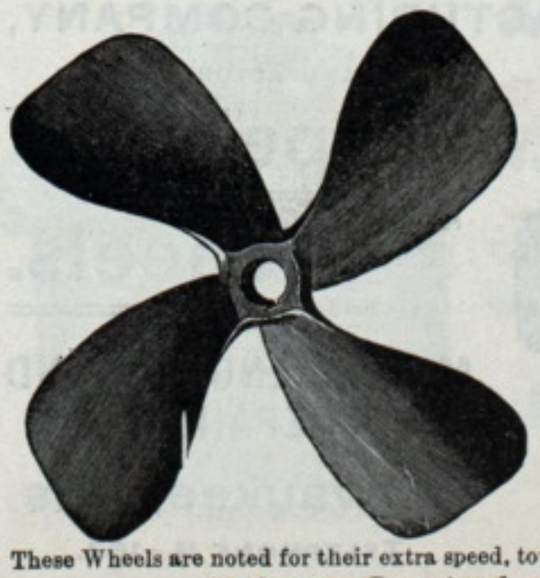

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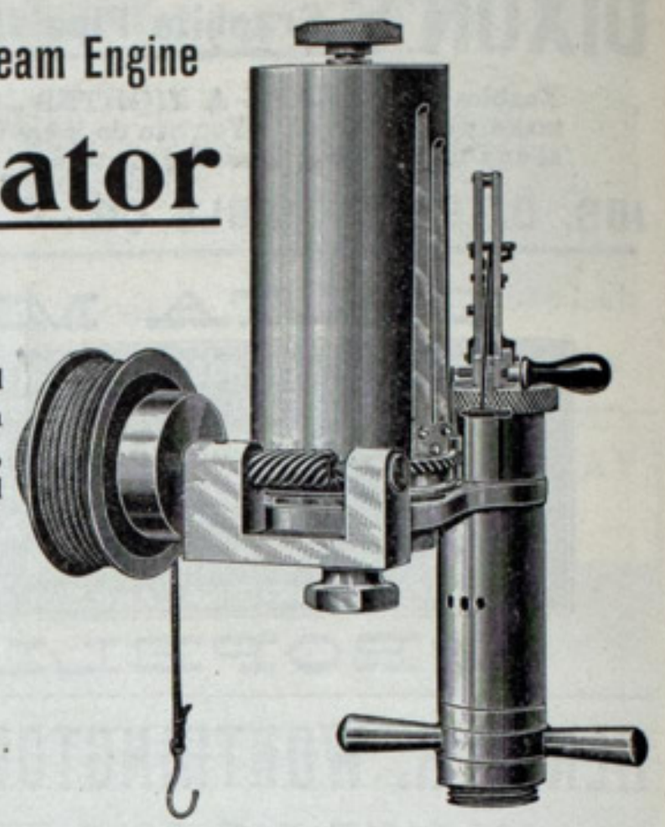

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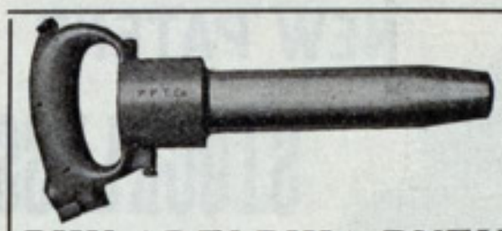

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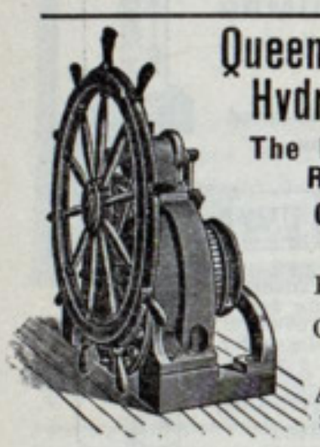

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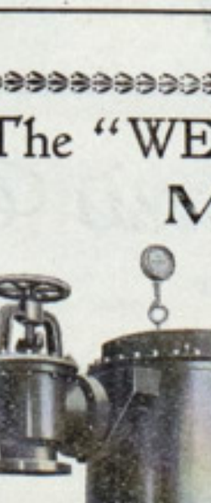

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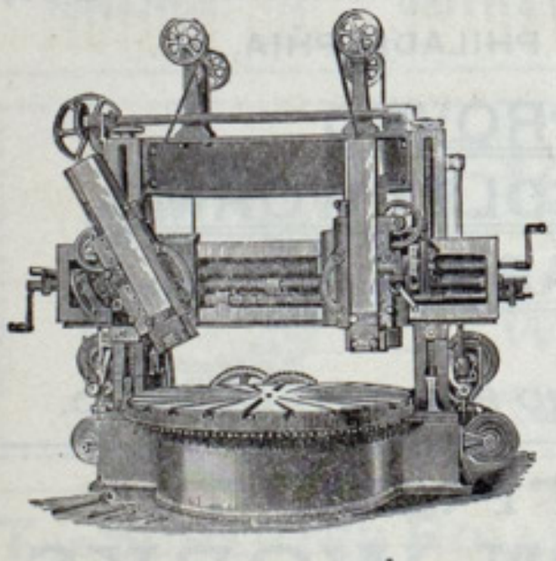

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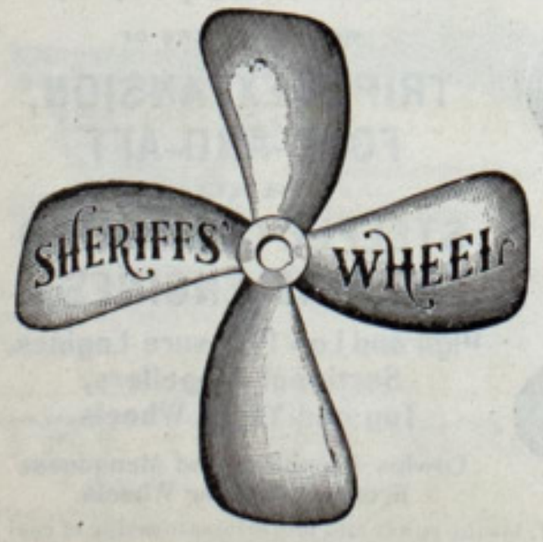

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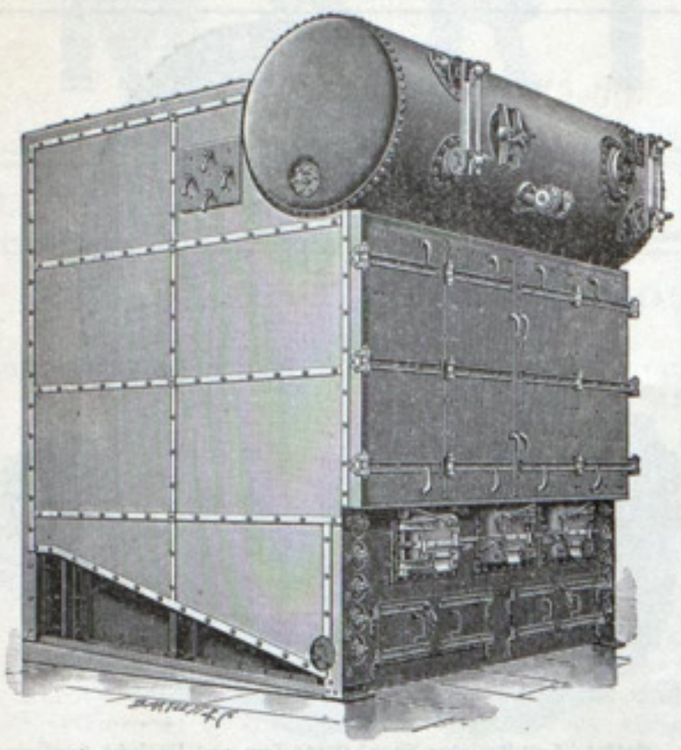

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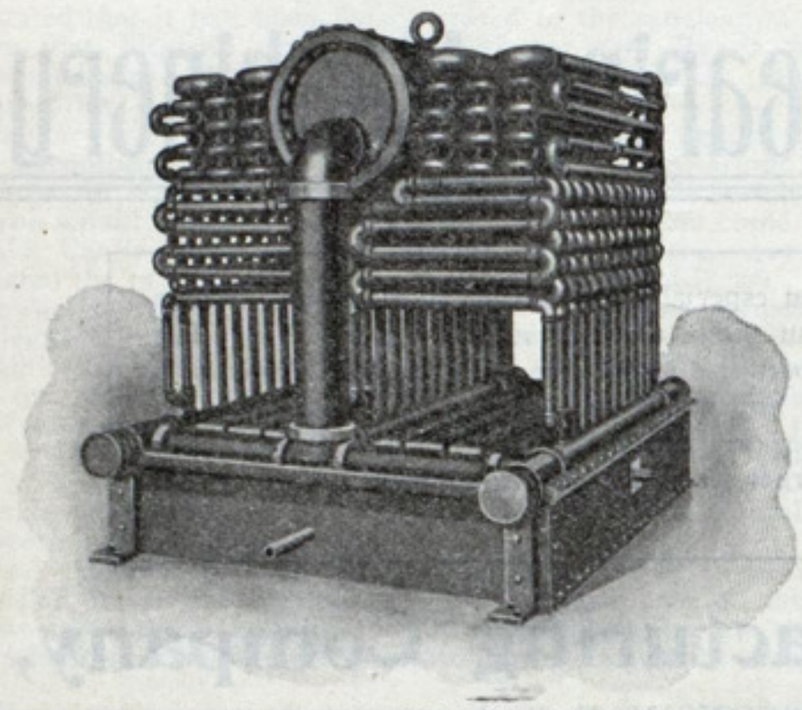

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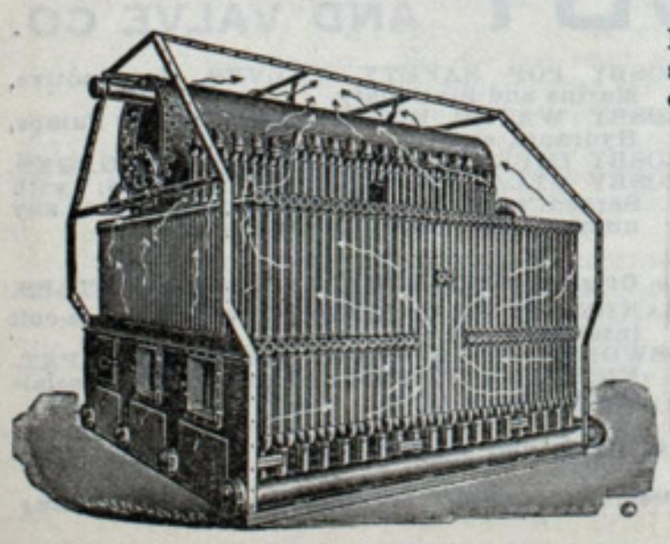

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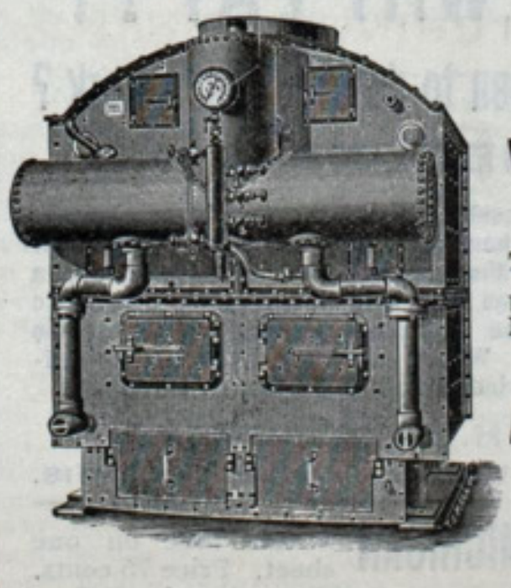

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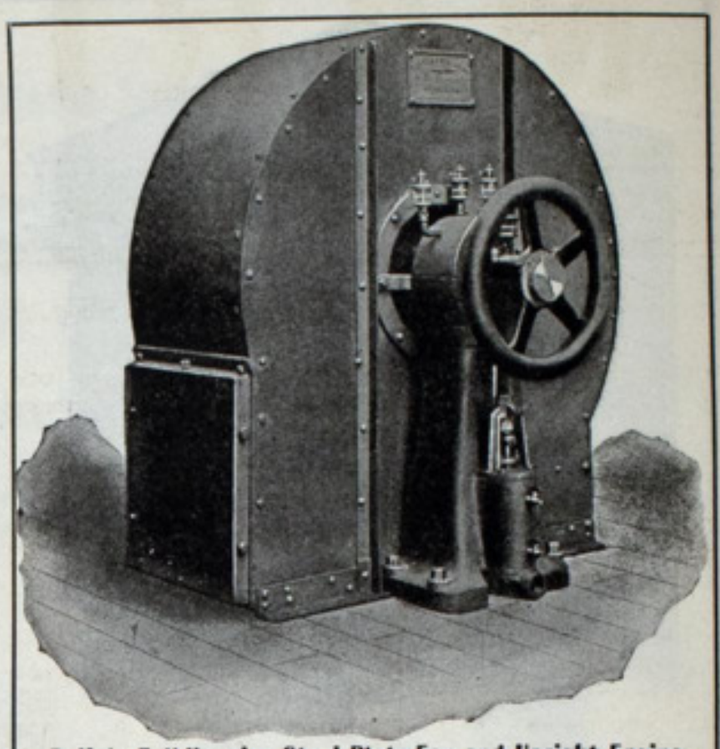

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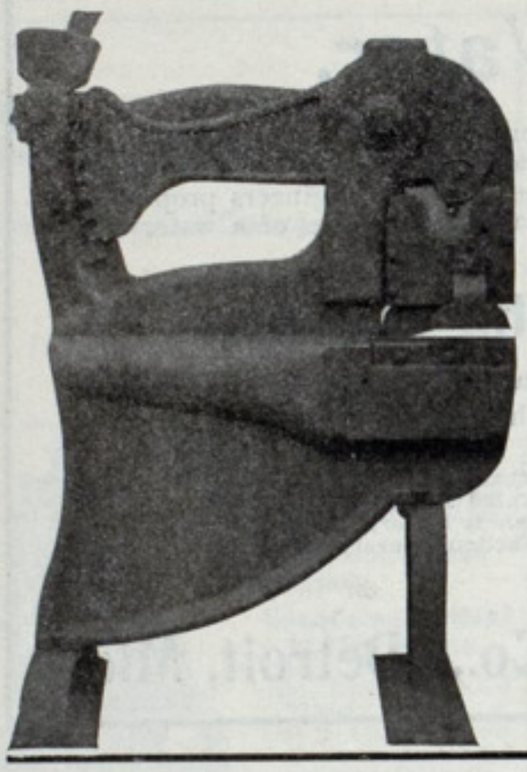

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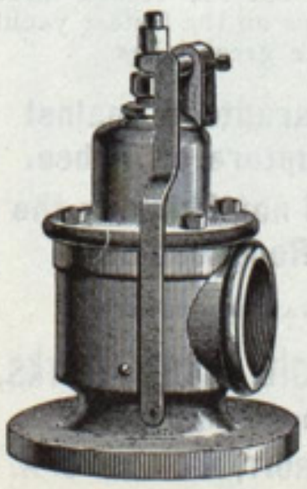

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